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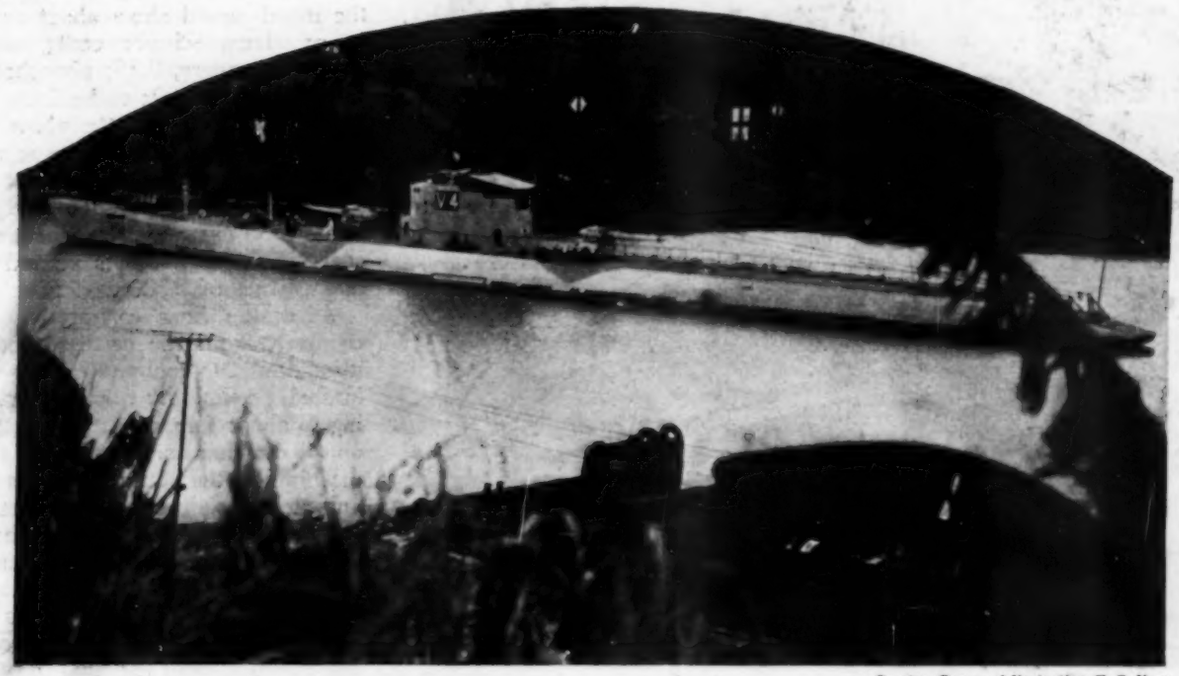


Courtesy Bureau of Navigation, U. S. Navy

The U. S. S. V-4, sister ship of the V-7, passing through the Panama Canal

CYLINDER LINERS FOR NAVY DIESELS

J. F. Crowell

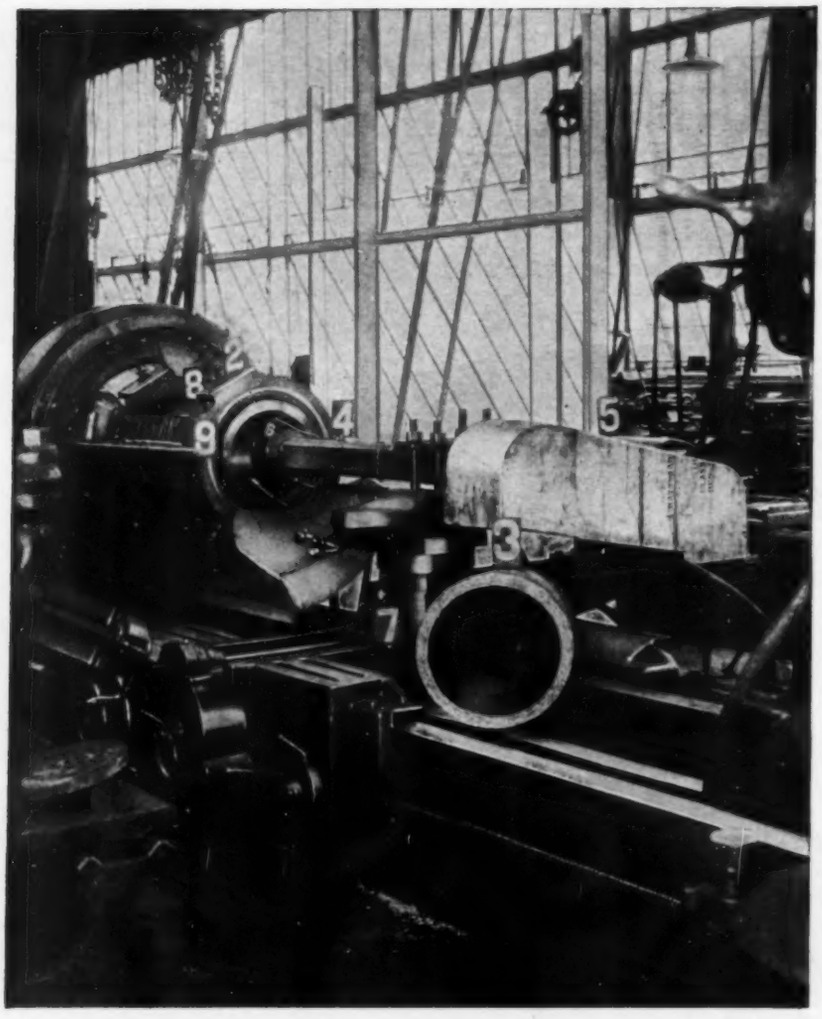
Lieutenant Commander, U. S. Navy, Navy Yard, New York

SIXTEEN years ago, the New York Navy Yard built two 2,500-hp., 2-cycle, 6-cylinder, Diesel engines for installation in the U.S.S. *Maumee*, a Navy oil-tanker of 14,500 tons displacement and a designed speed of 14 knots. At that time, the development of marine Diesel engines in this country had not reached the point where the construction of an engine of this type and power was an everyday occurrence, and the job required considerable preliminary study and preparation.

Since that time, the New York Navy Yard has built many engines of various sizes for installation in the Navy's submarine vessels, and is now engaged in the construction of the main engines for the U.S.S. V-7, the large submarine being built at the Portsmouth (N.H.) Navy Yard. All other Navy-built Diesel engines and parts are also manufactured at the New York Yard.

Because of this specialized work, a great deal of study and experimenting has been devoted to ways and means for improving design, material, and methods of manufacture. The development and construction of the several centrifugal casting machines now in operation at the New York Yard is the result of the efforts put forth to produce better parts, such as cylinder liners, for this particular class of work.

At the present time, over thirty different sizes of cylinder liners are manufactured for use in connection with Navy Diesel engine installations. These include both water-contact and skin liners, ranging in size from $1\frac{5}{8}$ to $25\frac{5}{8}$ in. inside diameter and $10\frac{7}{8}$ to 51 in. length.



The first grinder set-up showing (1) the fixture clamped to the faceplate; (2) the faceplate; (3) a finished liner; (4) the grinding arm containing the shaft; (5) the driving motor; (6) grinding wheel; (7) dial indicator; (8) steady-rest jaw, and (9) outer end of fixture, showing liner in position

Until recently, a large number of skin liners were manufactured for the purpose of relining the main engine cylinders of many of our older submarines. This particular use serves as a comparatively cheap and satisfactory way of salvaging cylinders, the bores of which have become worn to such an extent that further reboring would be imprudent. However, the practice is about to be discontinued, and will give way to a modern method by which these older engines are refitted with an entire new cylinder having a water-contact liner.

Notwithstanding the decline in the production of large skin liners for salvaging purposes, the yard will continue to manufacture the smaller sizes for the purpose of lining or relining the cylinders of the generator engines and air compressors which are an essential part of every submarine's machinery installation.

To withstand the hard service to which it is subjected, a cylinder liner must be made of non-porous, close-grained metal of uniform texture and hardness. In producing a liner having these qualities, the Yard has achieved excellent results, a result primarily of the fact that all liners are centrifugally cast.

The metal used in the manufacture of these liners is high-test cast iron of the grade commonly known as semi-steel. The specifications require it to be close-grained, of uniform texture, and to show a Brinell hardness of not less than 180 or more than 210. From two to four test specimens are taken from every heat and these must show a tensile strength of 30,000 lb. per sq.in. and a transverse strength of 2,500 lb. per sq.in., measured by a Standard Arbitration Test Bar.

Taking as an example the large water-contact liners now being manufactured for the V-7, an analysis of the metal would show about as follows: Iron, 95 per cent; carbon, 3.05; manganese, 0.75; phosphorous, 0.16; sulphur, 0.09; and silicon, 0.95 per cent. To obtain the above percentages, the cupola charge is made up approximately of 40 per cent steel scrap, 40 iron scrap (semi-steel), 10 low-carbon pig, and 10 per cent charcoal pig. The metal is poured at a temperature of 2,700 deg. F.

After the liner casting has been removed from the casting machine, it is allowed to cool and is then sand-blasted, preliminary to rough machining to about $\frac{1}{8}$ in. of the finished size on all dimensions. Following rough machining, the liner is thoroughly annealed to relieve internal stresses.

In order to ascertain whether or not the liner metal possesses the requisite qualities, and thereby to avoid unnecessary labor, it is subjected to a preliminary hydrostatic test identical with the final inspection test. Water-contact liners for the main engines of the V-7 are tested in the following manner: From the top to 8 in. below, 1,000 lb. per sq.in.; from the top to 35 in. below, 350 lb. per sq.in.; from the top to the bottom, 50 lb. per sq.in. Air compressor liners are tested to 150, 500, 2,000, and 5,000 lb. per sq.in. for the corresponding stages. Working cylinder skin liners are tested to 150 lb. per sq.in. from the top to one-third their length below, and 50 lb. from the top to the bottom.

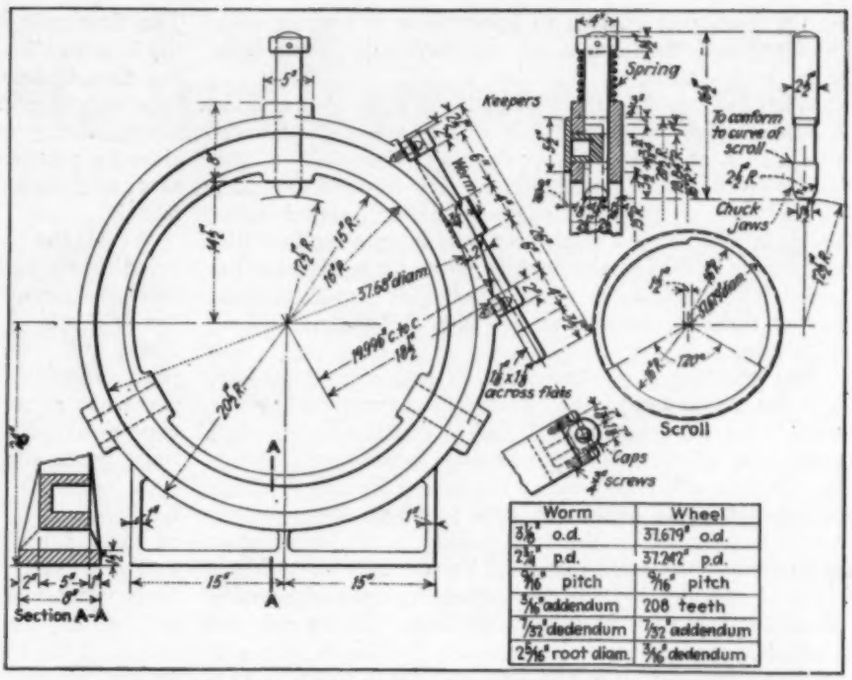
The preliminary hydrostatic test having been completed, the liner is bored out to within about 0.015 in. of the finished bore, the tolerances for this operation being plus 0.015 and minus 0.0000 in. In performing this work, machine operators exercise particular care to bore accurately, and concentrically with the outside of the liner, in order to facilitate grinding to the finished size.

Cylinder-liner bores have, for some time, been ground to finished size in practically all cases. At present, shop equipment consists of four internal grinding machines, the combined capacities of which make it possible to finish the bores of all liners, from the smallest to the largest, except where liner design prevents it.

About six years ago, work on Diesel engine liners became so heavy that the Yard found itself falling behind on its deliveries. Accordingly, a study was made of ways and means by which production could be speeded up. The result was a decision to try grinding for finish-

ing liner bores in every possible case. At the time this decision was made, manufacturers in this country, for various reasons, were not using large internal grinding machines to the extent that they are today. Before the method could be put into effect, it was necessary to procure the equipment.

Thus, the Yard was confronted with the situation of having to purchase an internal grinder of suitable capacity from outside sources or of designing and building one in its own shops. The latter course was adopted and resulted in the conversion of an old 20-in. by 12-ft. lathe to an internal wet grinder. The arrangement of this first machine is such that the liner revolves with the faceplate of the lathe, while the grinding wheel, as it revolves, travels through the bore of the liner in a fixed horizontal plane. The liner is inserted and secured in a heavy pedestal-shaped fixture, the base of which is rigidly clamped in a central position on the lathe's faceplate. Secured in the fixture, at each end, is a novel arrangement for centering and lining up the bore of the liner, consisting of a three-jaw steady rest housed in the fixture and operating similarly to a universal chuck. The shaft, carrying the grinding wheel on one end and the driving pulley on the other, is mounted inside a heavy box-shaped arm of two channel beams strapped together. The shaft is supported at its ends and center by three sets of self-aligning tapered roller bearings housed inside the arm so arranged that they take the thrust of the grinding wheel. The arm and a bracket supporting the motor are attached to the lathe carriage and travel back and forth with it. Transverse movement of the grinding wheel is accomplished by operating the carriage cross-feed mechanism. An ordinary dial indicator attached to the carriage is used to indicate the amount that the wheel is moved. Water for the grinding is discharged into the bore by means of a perforated water pipe connected to a rubber hose, and arranged in such a manner that it does not interfere with the grinding wheel. Until recently, this machine has been in daily use grinding liners between 9 and 14 in. in diameter. Satisfactory results obtained with the first machine led to the adoption of grinding as standard practice for finishing the bores of these Navy cylinder liners.



Special grinder chuck designed for holding cylinder liners

The year following construction of the first machine, the second internal grinder was built, having a capacity to grind bores as large as 18 in. in diameter. The general arrangement is practically the same, except that the machine is a dry grinder. The fixture, while heavily built, is shorter than that used with the wet grinder, and only one end of the liner is secured to it, the other end being unsupported. An exhaust blower draws the dust from the bore and discharges it outside the shop. A rather ingenious feature is a small nozzle-shaped fixture designed as an aid in carrying off dust and in preventing the wheel from loading frequently. This fixture is secured underneath and close to the face of the grinding wheel on the "leaving" side. In the side of the nozzle is a narrow slot about as long as the wheel is thick. The nozzle is connected to the discharge pipe from the blower by means of an air hose. In operation, loose dust in the wake of the wheel is drawn through the slot into the nozzle and thence into the blower discharge pipe. The arrangement functions not unlike an augmenter condenser in marine turbine installations. Another attachment which helps to keep the wheel clean is a small air jet which discharges compressed air against that part of the surface of the bore about to come in contact with the grinding wheel. In order to keep the liner from heating up, cooling water is run over the outside. It is believed that the performance of the two home-made internal grinders has been remarkable, for until recently, they have been in daily use doing work that has to be accurate to within 0.001 in.

The third internal grinder is a standard commercial type used to grind the bores of the small liners and needs no particular comment.

Recently the largest and latest internal grinding machine was added to the shop equipment. It is a commercial design built by an American firm. The machine can be used to grind liners up to 36-in. bore and is fitted for either wet or dry grinding. At present this machine is being employed in finishing the bores of the main engine cylinder liners for the V-7.

The liner is set up on the grinder table and secured in place by means of two chucks or steady rests, one at each end. These steady rests were designed at the Yard for this particular machine. The accompanying sketch shows their arrangement. It will be noted that the principle applied is similar to that of the universal chuck, but that the arrangement is simpler and more economical, the scroll being divided or separated into three sections in a rather unique manner. The design of the steady rests permits the work to be lined up quickly and accurately. Care must be exercised to avoid tightening the jaws too tightly. On one occasion the liner was found to be squeezed 0.003 in. out of round from this particular cause. The practice now is to set

up the jaws just enough to bring them in contact with the liner and then make any further adjustment with paper brass shims.

When delivered to the girder, the outside of the liner has been rough machined only and is about $\frac{1}{8}$ in. oversize. This, of course, allows for any eccentricity of the bore with the outside of the liner. The finished diameter of the bore of the main engine cylinder liners for the V-7 is 20.875 in. As machining tolerances are plus 0.015 and minus 0.000 in., the bore is generally between 0.010 and 0.015 in. undersize when grinding is begun. Grinding or finishing tolerances are plus 0.0005 and minus 0.0000 in.

Dry grinding is employed for all cuts except the last, for the reason that the work is accomplished more quickly by this method. A cut is considered one full movement of the grinding wheel back and forth. During the first cut, the speed of the table carrying the liner is relatively fast because of the fact that the grinding wheel bears only on the tool marks in the bore and is not down to the solid metal. The speed of the table is reduced considerably for the second dry cut and remains about the same for remaining dry cuts. These cuts are continued until there remains about 0.0005 in. of metal to be ground off. On the final cut, table speed is further reduced and wet grinding is employed. Reasons for making this change are, first, to keep the temperature down and thus prevent any expansion of the metal, second, to prevent, as far as possible, fine particles of the wheel from becoming embedded in the surface of the bore, and, third, to leave a smooth and "fine-appearing" finish.

In order to prevent the liner from becoming hot during dry cuts, cooling water is run over the outside by means of a perforated water pipe secured just above the top. Before the liner is removed from the grinder, the bore is given a preliminary inspection and carefully gaged. Final machine work consists in turning down the several outside diameters to the finished sizes. For this purpose the liner is secured on a special expansion mandrel and then set up in the lathe. The greatest tolerance is minus 0.002 in.

With the completion of the outside, all machine work on the liner is finished and is ready for final inspection. The first part of this inspection consists in subjecting the liner to a hydrostatic test identical with the one which has already been described. The last part consists of a thorough inspection of the liner for workmanship and finish, during which it is carefully gaged with micrometers for accuracy and size, then stenciled with the necessary identification marks and also with the inspector's initials.

While the foregoing is a brief description of the grinding operation and subsequent steps taken to complete the manufacture of large water-contact liners for the V-7, the procedure is practically the same in all cases. Of course the finished bore must meet all the requirements of the specifications, but the time and labor necessary to accomplish the grinding depend on variable conditions. Each liner presents a separate problem and must be handled accordingly.

In selecting a wheel for this work, great care must be exercised in choosing one that is suited for the work at hand, for while a wheel may be high grade and give entire satisfaction under some conditions, it may prove to be little more than useless under others. Such difficulties as the Yard has experienced with internal grinding have arisen from unsuitable wheels, especially in the case of dry grinding.

As there seems to be some difference of opinion regarding the strict requirements of the specifications for the manufacture of Diesel engine cylinder liners for the Navy, particularly in regard to grinding the bores to the finished size, it is perhaps desirable to emphasize the fact that they must be interchangeable and hence precise. Grinding the bores to the finished size assures accuracy, smoothness, and fine appearance, and in addition, represents a time saving of over 100 per cent when compared with the former method.

The records show that an average of three out of every ten liner castings removed from the casting machines during the past year found their way back to the scrap pile, having been rejected for one reason or another. Formerly the number of rejections was much larger. But of those liners that have survived, the records show a history of efficient and dependable service in the engines of vessels engaged in hazardous duty where efficiency and dependability are prime requisites.

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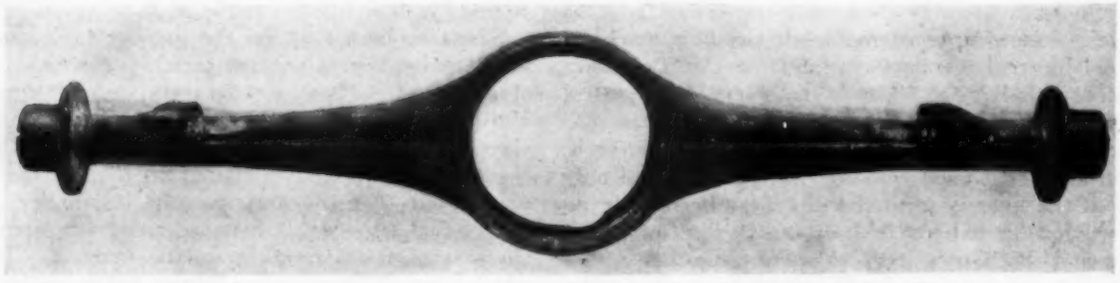
AN ARC-WELDED "BANJO"



An automatically arc-welded rear axle housing. Two heads start at the center of the ring and work outward simultaneously, the work then being rotated 180 degrees to permit similar welding of the opposite side. Production is 25 housings per hour, floor to floor, at a cost of 6 to 6½c. a housing

STAMPING MECHANISM PARTS

W. H. MALLIET
Supervisor of Design and Development,
Royal Typewriter Company

Helpful observations on punch press tool design and manufacturing methods

WHEN designing dies for small sheet-metal mechanism parts the closest thickness and width of stock for blanking the part is selected. In some instances a multiplicity of parts are fitted together, which if near one extreme tolerance limit would result in too great an aggregate variation or cause excessive wear in adjacent members. Then it is necessary to flatten the blanks to a closer limit to produce the desired fits in assembly.

Dimensions for a bent part are generally given from its seat and from the same side of the metal for parallel faces where possible. This avoids the introduction of stock thickness variations which may affect subsequent press operations or fits between bending punches and dies. The mean between the maximum and minimum stock tolerances should be the basis of design for bending punches and dies.

The material, its temper, the linear dimensions, and the nature of operations should also be considered in the determination of tool design and the selection of a press. Only in this way can be obtained the highest speed consistent with the accuracy required and the operator's safety. If a factory-designed safety device is not available, many commercial designs may be adopted which will be well liked by the operators. These are often faster than the double- or single-hand starting devices often used by some concerns. It must be remembered that all iron and steel safety means are subject to wear, to becoming loose, or to breakage of the pins and screws. Therefore they do not entirely eliminate accident hazard unless periodically inspected to insure that the working parts are maintained in proper condition.

Correctly designed beveled plates, one and one-half to twice the part thickness, with adequate dirt pockets for clearance, will increase the speed of operation in locating short parts that have leeway to increase in dimensions because of blanking die grinding. Locating pins to fit pierced holes, providing these holes are some distance apart and not near a bent edge, give a smaller production but are more accurate. Hence they are better than gage plates for precise work.

Fast production may be attained with the part held in the operator's hand when the blank can be suitably located to give the desired accuracy. This should only be attempted when the piece is long enough to project out of the tool so the operator's hand will not be endangered nor the accuracy of the work influenced. A part should not be dropped into place as it may become dislocated sufficiently to wreck the tool or spoil the work. Sometimes both hands are needed to locate such pieces.

It is generally preferable, though slower than other methods, to pick a piece from the tool; lighter pieces may be blown out and medium pieces allowed to fall by gravity if they are not covered with oil. An attentive operator should be set to the task of watching such parts to prevent wrecking the tool or spoiling parts which are sticky causing them to remain in the die so another part may be positioned on top.

Simplicity of tool construction decreases operating cost when upkeep is considered; therefore, it is not always practical to have a chute to carry the part to the die except rarely for parts of simple outline. Likewise the quantity of production should be large. Chutes may be provided to carry simple pieces to a box after the press operation but they must be watched to prevent sticking or piling of the parts. Very often it is possible to provide presses with sheet-metal chutes attached to the rear of the bed between the columns to carry the work.

Providing an operator is right handed, it is best practice for him (or her) to put the part into the die with the left hand and remove it with the right. When the operator is left-handed the process should be reversed. In piercing one or two holes in a long narrow part, up to 10 in. in length like a lever, a fast operator can hold a large number of parts in the left hand and take one at a time to the die and into the box. This keeps the press going almost continually. It is usually the best custom for the operator to take a large quantity of parts from the box and place them on a table or pan attached to the bed of the press. This is, providing the parts are not too large. If the parts are large, the boxes containing the work should be conveniently placed on the left side of the press and the empty boxes to receive the work on the right-hand side. Presses should be spaced to facilitate this arrangement.

■

The Upper Limit of Tapping Speeds

J. R. SWANTON
Toronto, Canada

JUDGING by the difference in practice, no one seems to know just how far tapping speeds can be economically raised. As a case in point, the spindle speed on a certain cast iron job was set for years at 330 r.p.m. In an attempt to improve the job, the speed was gradually raised, and an upper limit of 950 r.p.m. was finally reached.

Naturally the increase in speed is not the whole story. Unless production is continuous, it may not be worthwhile. An increase in speed may call for a new motor due to the increased power required, and the saving may not pay for the installation in a reasonable time. Another point is that a new jig may be required to enable the operator to take advantage of the increased speed. The standard tables seem to set speeds that are below the results achieved in practice.

EXECUTIVE FORUM

Lucky Number?

"ARE YOU superstitious, Bill?" Hartley Nelson, Comptroller of the Norwalk Loom Works, asked his friend, Bill Holland.

"Is this another of your jokes?" said Bill. "Superstitious about what?"

"Numbers for instance—and this is no joke," said Nelson. "I wanted to see whether or not you'd be prejudiced against my pet idea—or rather Sears, Roebuck's idea which I may adopt. I mean the thirteen-month year for business records. Several other concerns are using it, also."

"Now that I know what you're talking about, I'll admit I am superstitious when it comes to thirteen-month cost systems. I'd want to carry a rabbit's foot if I had to work with one."

"But the plan has lots of advantages," said Nelson. "Every month is equal in length—twenty-eight days or four weeks. All scheduling can be done in equal periods. No adjustments of standards or budgets are needed for the odd days in each month."

"What will your customers say when they get thirteen bills a year?" asked Bill. "And how will the Department of Commerce take it when you try to modify its ideas on monthly reports? How about quarterly statements to the stock exchange?"

Nelson smiled. "I see you've done some thinking on the subject yourself. Our customers will get their bills once a month—I mean the calendar month—as at present. It is just as easy to take off a statement every thirty days as at the end of an accounting period. Quarterly reports can include three periods for each of the first three quarters and four for the last. I find that practices for quarterly statements are not uniform now. We may have to fuss around a bit with government reports but that's the price we'll pay for the advantages of the plan."

"Then you'll have to convince the telephone, gas, and electric companies to render their bills every twenty-eight days," said Bill, "or adjust them also. How will the plan tie in with interest charges and cash discounts?"

"These objections are annoying but not vital. They are all based on differences between the thirteen-period plan and the present calendar. If the Cotsworth Calendar is adopted in 1933, we'll be that much ahead of the others. We'll have the advantage of thirteen sales peaks instead of twelve. Our salesmen have been trained to go after a monthly quota. Under the new plan, they'll have an extra month."

"As near as I can make out you'll need two accounting systems, one for yourselves and one for outsiders. Instead of simplifying your cost system you're going to pile on new complications. Besides your year won't come out evenly, causing more confusion."

"We'll take care of that," said Nelson, "by starting the first period on January 2 and having the last end December 31. Then our yearly records will coincide with the calendar year."

Bill consulted his calendar. "That will make all your weeks begin on Friday in 1931—more bad luck."

"Simply a matter of getting accustomed to it," said Nelson. "Of course we'll have to find a name for the thirteenth month."

"Yes," said Bill, "and you'll need a slide rule to figure whether your birthday is in July or Roebuck."

Topic suggested by H. S. Deeley, Johns Manville Company Ltd., Asbestos, Canada

■

What Do You Think About This Problem?

Other concerns such as the Eastman Kodak Company and the Square D Company have adopted a thirteen-period business year. The procedure is drastic but presents a number of obvious advantages. But there are numerous difficulties in correlating such a plan with time-established practices based on the calendar year. How would it work in your business?

. . . Discussion
of Executive Problems

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Ex Rights

A man's training and experience are his stock in trade; thus they belong to him by every right, and cannot really be taken away from him anyway. Granting this, I do not see why he must take physical evidence of his work with him, any more than that he should take a sample of some particularly intricate part he has fabricated in the shop. If it's his idea, surely he remembers enough of it to make his memory serve him in any adaption of it in a new concern.

In most cases, I believe the man who takes forms, drawings, charts, or tables with him is unconsciously confessing that someone else had a great deal more to do with their success than he is willing to admit. If so, he has no ethical right to them.

The better idea is to prohibit the taking of all such material by everyone. Then the man who really owns the idea, is not really handicapped in leaving, while the collector is forestalled. Such a rule should be subject to a liberal policy on specific request, with perhaps the best interpretation to permit writing in for information at a time when it is really needed. —A. A. CROWELL.

Salesmen in the Shop

In our plant, the sales office is at the front end of the factory and the shipping department at the other, about five minutes walk. Ever so often we machinists, with our greasy clothes and soiled hands, see parading down the aisle a group of salesmen, all dressed up, smoking cigars, chatting, and laughing. This does not make us feel very good, and we wonder why they are allowed to go through the factory. As is usually customary, the shop starts earlier to work and leaves earlier. The salesmen should find sufficient time after factory working hours to go in the shop if necessary.

—P. KORNAN.

How Much Incentive?

The need of careful investigation prior to the installation of a wage incentive plan is very apparent. Most executives consider labor the easiest factor to adjust of the three elements constituting total costs, namely: labor, material, and expense. Experience had repeatedly shown that of the three, labor is by far the most delicate component to lower, and unless skillfully handled, disastrous troubles result.

The specific plan to be adopted is something that an absentee engineer should not attempt to recommend. There are twenty-five recognized wage payment plans known to the writer, and no one of them is best for all circumstances. In fact, modern management advocates a variety of plans selected to suit varying conditions in different departments.

If the plant in question is an average one, defects in operating methods are infinitely greater than are defects in the skill and application of the individual operator. The first purpose of time and motion study is to discover defects in the process for which management is solely responsible. No matter how skilled the operator, the efficiency of the operation depends largely on factors outside of his control.

As special knowledge is required to train the personnel necessary to carry out the all-important work of job analysis, it is usually best to secure the services of at least one man from the outside who is capable of directing the entire installation. Needless to say, the engineer must be chosen wisely and enjoy the full confidence and support of the management.

—P. CLICKNER, *Time Study Engineer, National Acme Company.*

Square Deal or New Deal?

The first thing that Herbert Jennings should do, is to acquaint his president of the situation, and inform him that he is going to attempt to obtain Pop Nolan's cooperation, and that of the foreman. Failing that, he is going to clean house.

He should then summon Nolan and the foremen together; give concrete examples of their failure to cooperate, stress the declining production, and tell them that from now on he expects each to play ball with him. To counteract this harsh attitude, Jennings should state that the company needs every man who will give full value; no man need have any fear of losing his position, if he does this.

There is entirely too great a tendency in the industrial world for a new superintendent or works manager to bring with him several of his associates or former subordinates. This tendency is an indication of such a man's lack of confidence to swing things by himself. Every plant where such a change has taken place is full of gossip regarding men to be displaced and new men—friends of the new superintendent—to be brought in. This is a deplorable practice.

—JOSEPH HAAS, *Factory Manager, Francis Keil & Son.*

The Urge to Merge

It cannot be too strongly emphasized that the merger is at best a means to an end. The advantages sought through a merger are elimination of certain dangerous elements of competition, pooling of individual resources, and general simplification and consequent cutting of overhead charges and manufacturing costs. It should not be forgotten that a merger may fare worse than expected, and easily worse than the most progressive of the constituent concerns absorbed.

Small companies may be most advantageously placed for securing and serving certain lines of business. Some

work is peculiarly adapted to the methods of the progressive small manufacturer or repair shop. No amount of merging, of itself, can save a derelict industrial venture, or pull an inefficiently conducted business out of the fire. It may merely result in a bigger blaze. Hard thinking, hard work, tightening-up, and tuning-in are essentials of success. These secured, the benefits from merging have reasonable prospects of maturing. —W. R. NEEDHAM. *Stafford, England.*

Anticipation Without Realization

A bonus in any form is often looked upon with suspicion by some employees, as they figure bonuses are merely deferred wages. The most objectionable feature about a bonus is that employees depend on it, and if the firm suddenly decides that it cannot pay, the employees' faith in the management is badly shaken; the result is that they slow up in their work, and the cost to the company is far greater than it would have been had it paid the bonus.

A number of firms that at one time or other paid a bonus have eventually discontinued them. Some firms pay their foremen a yearly bonus in the form of a dividend on the company's earnings. Obviously this is intended as an incentive to keep costs down and eliminate waste.

The best form of incentive is to sell employees company stock as several large corporations are now doing. While this is not exactly a bonus, it is something that cannot be taken away from them; it is an incentive as well as a savings. Since an employee can accumulate enough stock during his active years to take care of him in his old age there would be no need for an old age pension. —W. J. OWENS, *Newport Rolling Mill Company.*

Research or Retrenchment?

Research is no longer a matter of scientific curiosity; it is practical insurance designed to protect a company's future. One should gather all known available facts before initiating any research along a particular line, merely to use as a starting point the other fellow's finishing point. Sometimes it is even advisable to double back a little, for while general information can be readily deduced from one industry's activity, real research demands a minuteness of detail that is peculiar to one's own organization and equipment, so that knowledge ascertained may be directly translated into production.

If research engineers had only a little more sales ability rather than all scientific and technical, the problem would be much more rigorously indorsed in the affirmative throughout industry today. At present, when sales are falling off in many industries, it is unfortunate to witness the haphazard attempts to find new products that are being made by concerns that thought research a mere fad. Research has a negative as well as a positive value; in addition to finding new products and new material utilizations, it also saves the company from ill advised attempts to go blindly into new products. The research department is the fact finding arm of the technical organization. —JOHN F. HARDECKER, *Naval Aircraft Factory.*

The Fewer, the Higher

It stands to reason that no manufacturer can put through one piece at the cost of regular production. Any customer, who is a competent business man, will realize this and not complain. In the case cited, the customer did not need a whole new machine; he needed but one part, and the cost of that part even though high, is nowhere near the saving he makes by getting it. In addition to the figures given in the estimate, there is one thing that cannot be charged; yet it is a real cost. I refer to the interruption of the production schedule, which may more than offset any profit made on the job. No manufacturing concern that I know of is out looking for repair jobs; they are considered a bugaboo, but are taken to keep the good faith of the customer, who in many instances would be better off with a new machine. Give the manufacturer a fair break when you read his price on a repair job, for any little profit that he derives from it, he certainly is entitled to.

—CHARLES R. WHITEHOUSE, *Standards Engineer, The Holtzer-Cabot Electric Company.*

Too Much Specialization?

Laborers' work cannot well be specialized, and to have them tied to work of some sort while skilled men are employed on laborers' work, makes for inefficiency. My remedy would be to divide laboring gangs into two lots. One gang should consist of men who are employed on work which cannot be left, and one of men, who although they are employed, can leave on short notice.

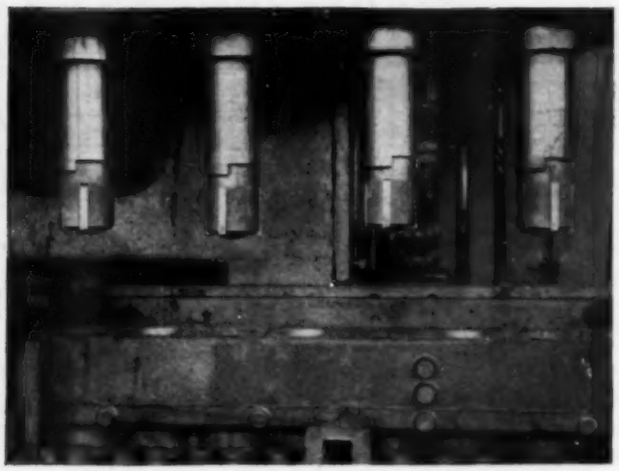
There will therefore be a reserve of laborers. Any foreman should be free to obtain the services of any of the second class when there is extra work to be done iin his department. The laborers should come under the supervision of the superintendent or the efficiency engineer, to whom the foreman should make application for the services of extra laborers. —W. E. WARNER, *Billericay, England.*

The More the Brainier?

In plants using interlocking responsibility, conferences and committees are quite often required to secure action on vital questions. This has grown through the placing in responsible positions of executives who are not thoroughly trained. These untrained executives have been making a large percentage of mistakes, and to eliminate costly errors, management has resorted to interlocking responsibility. When an executive has proven himself capable of assuming sole responsibility, it is much better to leave the job entirely in his hands.

A manager who develops his executives will eliminate the necessity of interlocking responsibility. However, the management must know the subordinates' weaknesses and shortcomings, and check their decisions whenever they are likely to slip. The answer to this problem depends entirely upon the way that the executives have been trained. A shop training executives to shoulder responsibilities and to act on their own initiative, will avoid costly conferences; while another shop, employing untrained executives, must interlock their responsibilities and leave major questions to conferences and committee meetings. —C. F. STAPLES.

Finish milling cutter with tungsten-carbide tipped blades



Inserted-blade boring bars tipped with tungsten carbide

Tungsten Carbide *for* Automotive Tooling

Milling and boring operations on the new Nash "8" cylinder block are performed faster with special equipment

AUTOMOTIVE production has always been synonymous with mass production and has set the pace for all industry. It is not surprising, therefore, to find one of the first concentrated adoptions of cemented tungsten carbide in that field.

In the new line for producing cylinder blocks at the Milwaukee plant of the Nash Motors Company, there are several significant factors. In the first place, this block, which has the crankcase with its flanged ends cast integral, is for a new low-priced "eight," the first to be built at this plant, and hardly one-tenth of the machines used to turn out cylinder blocks for the old "six" were rebuilt for work on the "eight." This meant that for all tooling applications with the new cutting alloy, the machines were bought specifically for this purpose. But because single-purpose equipment of this type generally comes with fixed feeds and speeds, its purchase definitely committed the economy to the continued use of tungsten carbide, since no other cutting alloy could stand up long under the same operating conditions.

With 90 per cent of the equipment new and of that one-quarter tooled up with tungsten carbide, this is probably the most modern cylinder block production line in existence. Much of the machinery represents machine tool models put into application for the first time. Perhaps the most striking feature of the new equipment is the massive fixture construction used to assure absolute rigidity of the work under the high speeds and feeds.

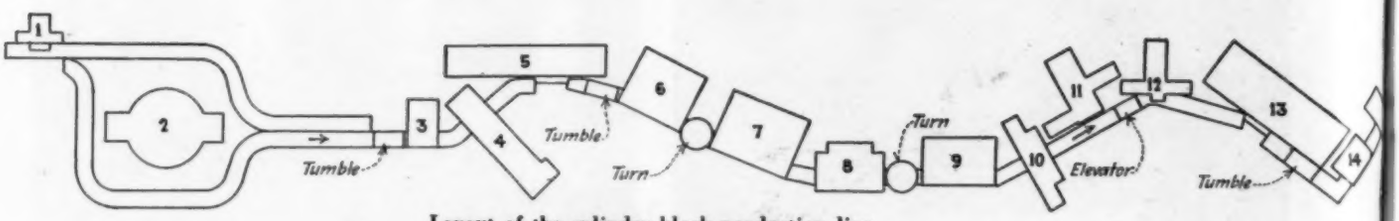
Considerable originality was shown in the layout of the equipment. Instead of passing straight down the bay the roller conveyor line winds its sinuous way past, and in many instances through, the machines, grouped at convenient angles to the line, as the floor plan shows. With this arrangement, a very considerable saving in the length of the line was effected, and at the same time, because of the angular placement of many of the machines, the side space required was not increased materially.

Of the nine operations specifically tooled up with tungsten carbide, four are milling, three rough boring, and two finish boring. The first "T.C." milling job is finishing of the top and bottom faces of the cylinder block and crankcase. This is the second operation on the piece, the first being the milling of a locating pad on the side of the block as it is received from the foundry. A 112-in. Newton rotary is used for the work. It is provided with four 11¾-in. roughing cutters and two 20-in. finishing cutters. Production data taken during the first month of operation follows:

Cutter Type	Rough	Finish
Cutter diam., in.	11¾	20
Feeds, in. per min.	24	24
Cut, bottom, in.	5/32	0.015
Top, in.	3/32	0.015
Speed, r.p.m.	45	15
Speed, ft. per min.	135	75
Chip load per tooth, in.	0.016	0.030
Pieces per grind, average	125	1,350
Low	43	1,139
High	323	1,567

Castings have a specified hardness of 185 Brinell.

Much higher cutting speeds are used on the Newton



Layout of the cylinder block production line
(List of equipment and data on page 886)

duplex planetary machine used to mill both ends of the block as well as the fan pad and starter pad. One head carries a 5-in. cutter for finishing the flange on the bell housing; the other, two cutters, 4½ and 6 in. for the fan bracket pad and gear-case cover face. All cutters are of the inserted blade shell end mill type. In this set-up, the work is clamped in a fixed position pneumatically, and the cutters are swept past the ends in circular arcs under the planetary action.

The following data is typical of this operation:

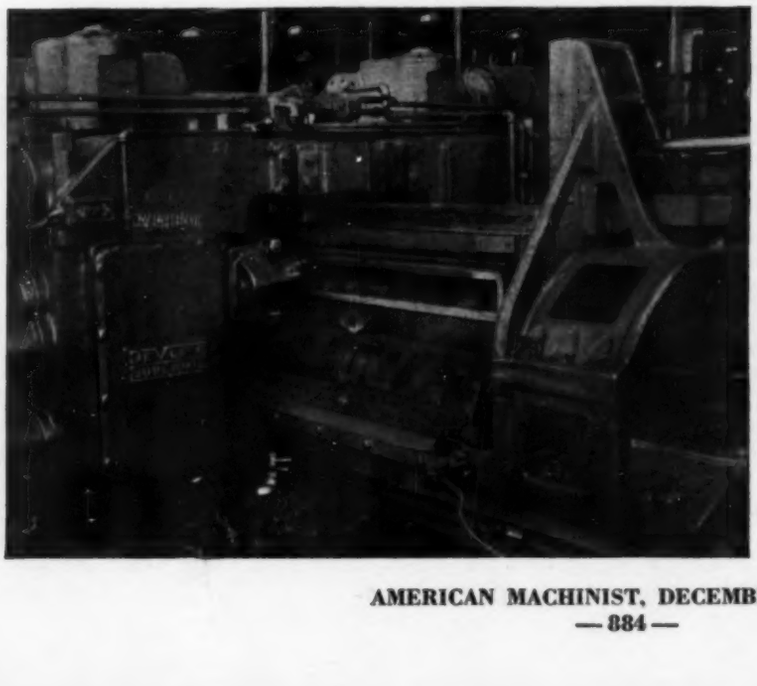
Cutter diam.	4½	5	6
Feed, in. per min.	33.7	23.6	16.6
Speed, r.p.m.	297	191	158
Speed, ft. per min.	370	262	262
Chip load, in. per tooth.	0.009	0.010	0.0065
Pieces per grind	500	500	500

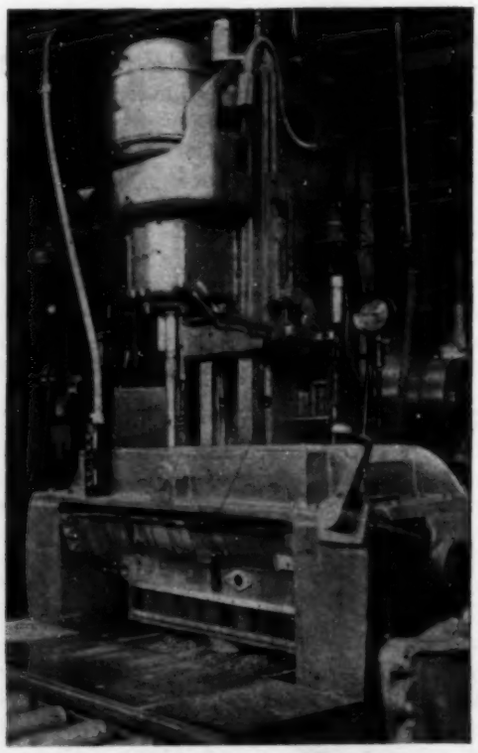
Even higher speeds are used for the small shell end mills, tipped with tungsten carbide, and employed on the De Vlieg Supermill in which two major pads on the sides, as well as several smaller bosses are milled. The flange of the water jacket pad presents a severe ordeal because of the tendency of the edges to chill. By cam control the cutter drops down one leg of the pad which is U-shaped, follows the long horizontal section, and rises at the other end. Because of the amount of metal surrounding these vertical legs, they are relatively soft, but the lower bar is surrounded by cored areas and is therefore hard. To take account of this difference, the feed on the descent and rise is rapid, 31 in. per min., and for the horizontal travel is dropped to 12 in. The cutter speed remains the same, being 320 ft. per min. for a 3¼-in. cutter. An average of 200 cylinder blocks is finished per grind.

An even more severe condition is found on the other side of the block where a long, narrow, rectangular pad is milled by a 5-in. cutter in one sweep. Here the area of the chilled edges is double that of the previous pad, and the cutter life must perforce be lower. Using the same horizontal feed and speed, a production life of 60 castings between grinds has been obtained.

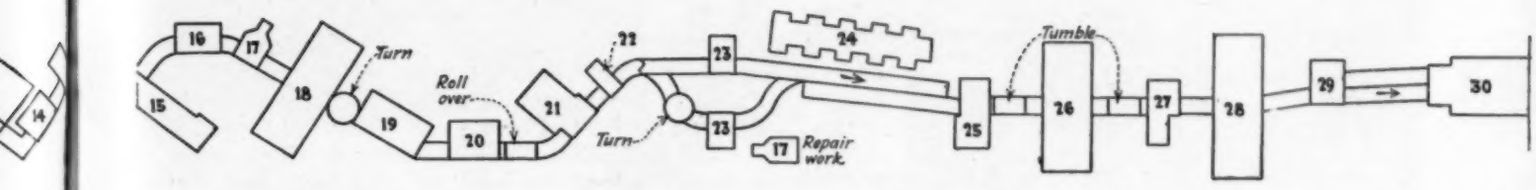
Two 2¼-in. cutters on disappearing spindles duck in and out of the obstructions and mill small pads here and there, all under control of hydraulic pistons. Another feature of this unit is the fact that the two side columns carrying the fixed and disappearing cutters are tied together at the top by a heavy bridge member which also carries guide shoes for steadying the massive work-holding fixture. These guides bear against finished surfaces of the heavy clamp bar. This construction assures the absence of deflection in both the work and cutter supports, a condition highly necessary for the successful application of tungsten carbide, as destructive chatter is eliminated. The work-holding fixture straddles the table

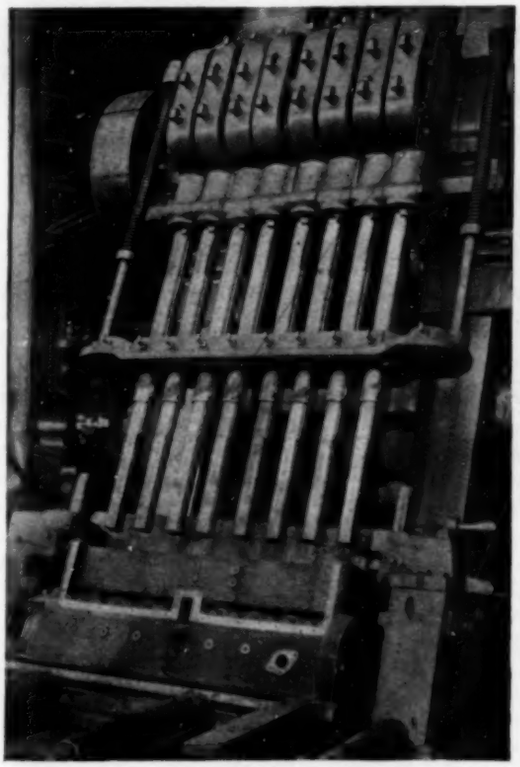
For maximum rigidity this miller is literally built around the work



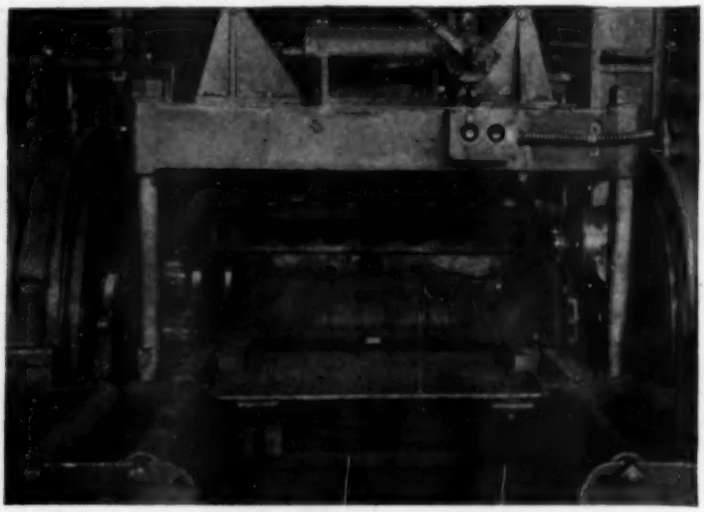


This automatic reamer moves automatically from one valve tappet guide hole into another





Tungsten-carbide tipped flycutters, two in each bar in this Moline unit, finish bore the eight cylinders



Two opposed planetary heads carry these tungsten-carbide tipped cutters at high feeds through the work

on which it is mounted in such a way that the finished block can be pulled through it. In this way, the table becomes a link in the roller conveyor line and itself carries rollers to facilitate loading and unloading.

Another milling machine in which tungsten-carbide cutters are found, and in which spot milling operations are performed, is the Kempsmith Maximiller.

Figures on performance are:

Cutter size, in	1⅞	2½
No. of cutters	2	1
Speed, r.p.m.	556	380
Speed, ft. per min.	272	250
Table feet, ft. per min	2.3	2.3
Pieces per grind	700	300
High	.....	980
Low	.....	65

For the rough boring operation on the main and camshaft bearings, a Barnes single-end horizontal machine with hydraulic feed is used. An extremely massive fixture has been supplied to hold the casting which is clamped in an inverted position on a heavy clamp plate. This plate is suspended from four tension columns and is raised to the hold position pneumatically, then clamped mechanically by means of a toggle mechanism. Positioning of the piece is by studs in the locating holes in the crankcase flange.

In the boring bar for the main bearing are nine ⅝-in. tungsten-carbide bits, and in the camshaft bearing bar, six ½-in. bits. The cutters operate at 173 and 182 ft. per min., respectively, and the feed is 0.0127 in. per rev. With a 4-in. cut, the total boring time is 1.04 min. Cutter lives between grinds are low, 5 to 50 castings.

In the succeeding set-up, where these same bores are semi-finished, the same speed and feed is used. Because of an additional operation on the front end of the cylinder block, that of boring the generator saddle and starter hole, a double-end machine is used, but the fixture design is practically identical.

Similar equipment is used further down the line at position 15 for finish-boring these bearings. Speeds of 182 and 195 ft. per min. are used, with feeds of 0.029 in. per rev. The average cutting time is 2.42 min.

Rough boring of the cylinders takes place in an 8-spindle Moline machine. On account of the heavy feed on the rough cut, large gears are necessary, and an inherent limit is placed on the center-to-center distance of the spindles. Consequently, only every other hole can be bored in a block, and two set-ups are necessary. Two castings are bored at once, a single casting being completed at each cycle. The tungsten-carbide bits are held in Hoch dual-locating type rough boring heads with wedge pins, much like shell end mills, and a feed of 4⅛ in. per min. is used. With this feed, and a speed of 103 ft. per min., a life between grinds of about 1,200 bores has been obtained, the average being 716, com-

Equipment Layout and Operations

No.	Machine	Operation
1	Cincinnati No. 2 miller	Mill locating pad
2*	112-in. Newton rotary mill	Mill top and bottom of block
3	Barnes drill	Drill and ream two ¾-in. locating stud holes
4*	Barnes single-end, horiz. boring machine	Rough bore main and camshaft bearings
5*	Barnes double-end horiz. boring machine	Semi-finish bore main and camshaft bearings; finish bore starter and generator saddle
6*	8-spindle Moline boring machine	Rough bore cylinders
7*	Newton duplex planetary	Mill ends to length and mill fan pad
8*	DeVlieg "Supermil"	Mill boss flanges on both sides
9	Ingersoll mill	Straddle mill bearings to length
10	2-way Colburn drill	Face cam bearings
11	Natco 2-way horizontal drill	Drill and ream breather hole and fuel pump hole
12*	Kempsmith No. 2 "Maximiller"	Finish mill water pump pad
13	Baush 3-way drill, bridge type	Drill 60 holes in top and both ends
14	36-in. Moline 16-spindle drill	Drill 16 $\frac{5}{16}$-in. tappet holes
15*	Barnes single-end horiz. boring machine	Finish bore main and camshaft bearings
16	36-in. Moline 16-spindle reamer	Semi-finish ream 16 tappet guide holes
17	Hammond radial	Chamfer guide holes
18	Baush 3-way drill	Drill 122 holes in bottom and sides
19	Barnes vertical 1-spindle automatic reamer	Finish ream valve tappet guide holes
20	36-in. Moline 8-spindle drill	Chamfer bottom of cylinder bores
21*	Moline cylinder borer	Finish bore cylinders
22	20-in. Barnes drill	Chamfer top of cylinders
23	Davis & Thompson 6-spindle drilling and boring machine	Drill, spot face, bore and ream distributor hole
24	5 Baker No. 217 drilling machines	Finish ream cylinder bores, one at a time
25	Millholland unit drill heads (3)	Drill oil, water, and lock-screw holes
26	Baush 3-way tapping unit, bridge type	Tap holes in bottom and sides
27	Millholland unit drill heads (4)	Drill 16 holes and tap 2
28	Baush 3-way tapping unit	Tap 43 holes in ends and top
29	Barnes lapping machine	Lap cylinder bores
30	Washing machine	Wash complete casting
..	.....	Inspect

*Tooled with tungsten carbide.

pared with 180 bores for an older cutting alloy. Cutting time is 1 min. 50 sec.

Finish boring of the cylinders is done with a pair of flat Davis bits in each bar. An 8-spindle Moline unit is used with helical worm drive. Because of the lighter loads and lighter gears, the spindles can be arranged in line with each cylinder, instead of alternate cylinders as in the rough boring operation. The flat bits are free to find their own centers and follow the holes, at the same time maintaining exact diameters. For this work a feed of 0.042 in. per rev. and a speed of 117 ft. per min. are used. Since the tools cut only clean metal, free from hard spots, a very long wear life is obtained. Cutting time is 1 min., 20 sec.

With equipment furnished solely for use with tungsten-carbide tools, no comparative performance data is available. As a matter of fact, the combination of feeds and speeds used on castings harder than the usual run of cylinder blocks presents a set of conditions under which high-speed steel cutters would not last long.

No drilling, reaming, nor tapping units are tooled with other than high-speed steel. High-speed steel cutters are also used for the low-duty milling operations, such as the first, forming a locating pad, and finishing the ends of the main bearings to length by straddle milling. Facing of the cam bearings is done with high-speed cutters in a double-end boring unit.

Little trouble has been experienced with cracked or broken bits; such as have occurred have been usually traced to grinding faults. In fact, proper grinding is the key to the successful application of tungsten carbide. Too fine a wheel will result in checking and ruin of the tool; too fast a cutting speed brings on the same results, as does also too heavy a feed. If the bit is fed into the wheel about 0.001 in. at a time, no trouble will be encountered.

■

Taps and Screw Threads—Some Fundamental Definitions—*Discussion*

By W. Roland Needham
Engineer, Design Dept., English Electric Co., Ltd.

THE IDEA of the Reference-Book Sheet under the title given above, on page 29, Vol. 72, of the *American Machinist,* is altogether admirable. In both the theory and the practice of engineering there is too much of ambiguity, so much so that it is hard for an engineer from another part of the country to know what a particular term may mean. There is thus abundant scope for a reasoned attempt at standards of terminology. It is to be hoped that the good work may continue.

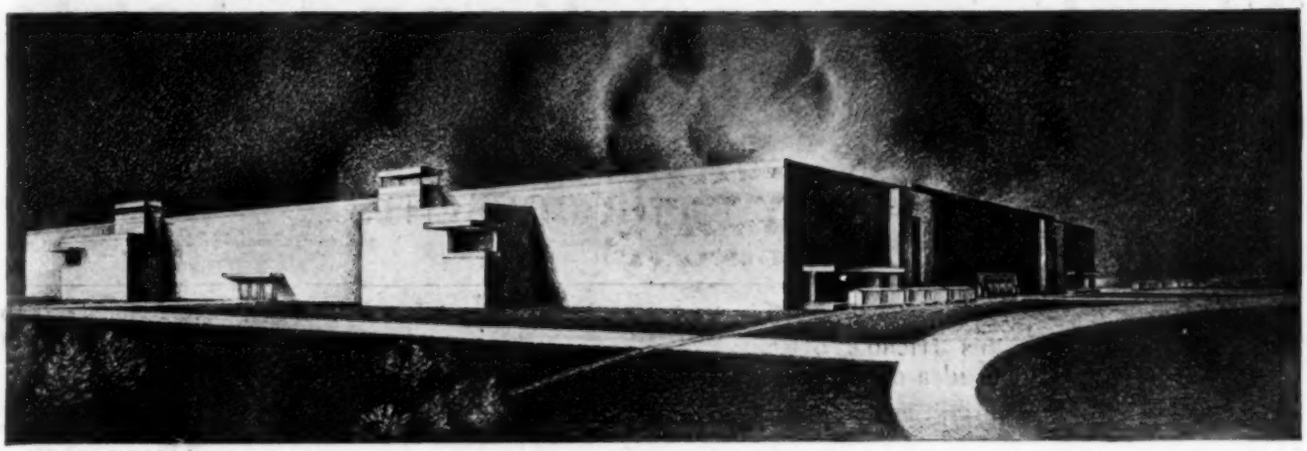
In this connection, American readers may be interested to know that their British cousins have been up against pretty much the same sort of thing. Recently, a definite bid has been made to standardize electrical terms. Within the last twelve months, those responsible for the publication of the British Engineering Association Specification, Parts 1 and 2, 1929, have incorporated in the text of both issues a comprehensive nomenclature of terms. This was found to be most advisable in such a connection, the specifications dealing as they do with standard keys, keyways, splines, and serrations. It is to be hoped that by this means (and this is the avowed intention of the subcommittee) to remove much of the confusion which had previously arisen by reason of the great diversity in the technical terminology used.

It is good on all counts to know what the other fellow means when he uses certain terms, and good for the other fellow to know what we mean. So whether on your side or ours of the Atlantic, all power to the attempt to establish a commonly-accepted and commonly-understood engineering terminology.

■

Accurate Contour Tooling—*Correction*

IN MAKING up the article under the above title, Figs. 3 and 7, on pages 766 and 768, Vol. 73, were inadvertently inverted. The caption for Fig. 3 applies to Fig. 7, and vice versa.



NO WINDOWS

Designed deliberately to achieve definite manufacturing objectives, the new Simonds plant will have no windows whatever. A contrasting design, the Toledo Scale plant, will be shown next week.

INDUSTRY'S first windowless factory building, into which the sun will never shine, embodies radically advanced ideas for scientific working conditions. It is to be constructed for the Simonds Saw & Steel Company on a 54-acre site at Fitchburg, Mass. Plans for the $1,500,000 plant were announced some time ago in *American Machinist*. One story high, 360x560 ft., and covering nearly two city blocks, the structure will have solid roof and walls unpunctuated by windows.

Designers of the new Simonds plant claim that the glass in the windows of the ordinary factory building excludes beneficial ultra-violet rays and that these rays can be better supplied by interior lighting. The windows of factories, they say, are usually not kept clean enough to permit the entry of sufficient light for proper working conditions, and furthermore, daylight is constantly changing in intensity, thus giving workbenches proper lighting for only short periods of each day. The Simonds plant will be illuminated by 1,000-watt lamps mounted 18 ft. above the floor line and inclosed in special steel diffusing shades which will give a uniform light intensity of twenty foot-candles on the working plane. Ultra-violet rays will also be introduced by this means.

Ventilation will incorporate automatic control of humidity and temperature. Every ten minutes, more than 500,000 cu.ft. of air, tempered and cleansed of dust and other impurities, will be brought into the building, providing a complete change. Hot weather cooling will be performed by an atomized spray bank, cold weather heating by coils in auxiliary fan houses, the amount of heat delivered to the air being thermostatically controlled. Fumes, gases, exhausts, and excess heat will be removed by underground ducts.

Acoustical walls, ceilings, and floor, isolation and padding of large machines, and actual silencing processes will keep noise down to a minimum. The floor will have a concrete base with acoustical wood block for portions not occupied by equipment foundations. Cork pads will be used to isolate noise and vibration-producing machines. Masking, tempering, and damping will be used to reduce noises from material in process of manufacture.

The roof, apertureless like the walls, has high sound absorbing efficiency. The lowest layer is a perforated metal deck to permit passage of sound. Above this is a 1¼-in. layer of rock fiber bound in asphalt. Over this are two ½-in. layers of insulating board secured in asphalt and surmounted by built-up waterproofing. This type of construction also permits heat insulation. Walls will be acoustical block with a facing of brick for architectural effect. The building is expected to absorb at least 60 per cent of the usual sounds, in fact the plant office, located at one end, will not be partitioned off.

Psychological effects of color were also considered in planning. The interior walls and the ceiling will be blue, green, and white, the blue to reflect certain ultra-violet rays from the lamps, the green to be the active or energizing component, white to give the sensations of light and cleanliness. Machines will be painted orange for visibility and consequent aid in accident prevention.

Machines will be laid out for straight-line production and minimum working fatigue. Further benefit to the workers is expected to result from the proposed rearrangement of working hours. Two working shifts a day are planned, one from 5 a.m. to 2 p.m., the other from 2 p.m. to 11 p.m., this schedule to allow all workers a chance to get sunshine during their hours off. A comprehensive study is also being made to reduce unnecessary motions to a minimum, one of the first steps in this direction being the lessening of the number of columns to 56 and the elimination of partitions.

Tests of these ideas carried out by the Simonds company have shown as much as 33 per cent increase in efficiency of workers.

The Austin Company, designer and builder, has promised completion early next spring. All departments of the Simonds Chicago plant and of the two present Fitchburg units will be concentrated in the new building.

The Foreman's Round Table

BY THEIR PRESENTS

"SAY, Al," exclaimed Ed as he burst into his friend's office. "What's the big idea of posting a notice like this?"

"Oh, it's you, is it, big boy? Which notice are you talking about and when was it posted?"

"Well, maybe it isn't posted yet. I just got mine and it isn't going to be posted. Wait til I read it to you: 'For the benefit of new employes we post, each year, a notice stating that it is against the policy of this company for any employe to accept a gift from a subordinate. None of us has done anything that justifies using your hard earned money to buy us presents. That being so, any presents given would be construed as a bid for future consideration and would, therefore, embarrass us in our business relations.' I call that interfering with personal liberty."

"Whose liberty, Ed? The man's or the foreman's?

"Both, by heck! And I declare right here and now that if my men want to give me a present I will accept it, policy or no policy. Besides, we haven't any new employes, and I don't remember seeing this notice last year."

"Williams is using the diplomatic approach, and everybody but you will take it for granted that this has always been the policy. But why get all 'het' up? I can't imagine anyone wanting to give you a present anyway."

"Funny, aren't you? I like Williams, but he sure does get away with murder under the guise of management. When he starts to tell a man what he can do with his own money, though, he goes too far."

"Man is a reasoning animal, so be reasonable. You know and I know men that can't buy presents for their own people, still they are called upon for subscriptions to buy presents for their foreman, and maybe for the clerk and the superintendent. I have a suspicion that sometimes the movement is instigated by the one who expects to receive the present. Why put yourself in that class?"

"I don't intend to, Al, but what could Williams do if the men did buy a present? Suppose they sent it to the foreman's house, what could he do?"

"Now you are talking about crooks, not foremen. If any bunch of men were so insistent about buying a present for the boss, it would be because they either had to, or thought they did. If the foreman was willing to hide the fact that he had received one, the only thing to do would be to wait until the reason made itself clear."

"Well, I suppose I might as well post this notice, but I don't agree with it. If you see me driving a new car you'll know I'm a crook, as you say. If I am wearing a new tie you will know I am honest. It depends upon the size of present, which I am."

"Bunk, Ed! Say, did you ever hear what Tom Reed, the Speaker of the House, told the congressman who declaimed that he would rather be right than be president?"

"No. What was it?"

"Don't worry, friend, you'll never be either."

Some firms tacitly agree to the practice of giving presents by their silence. There would seem to be no argument about presents this year, but some people fear that the practice will be even more prevalent as a job retainer. What is your opinion? Are "presents" at all defensible?

▸ ▸ ▸ Discussion of Former Topics

In the Driver's Seat

The easiest way out of the dilemma in which Al finds himself is to let the man go; although I'm sure it won't be the most satisfactory one.

The foreman who takes his job and the responsibilities that go with it seriously would not take this step unless all other ways and means had been exhausted.

A great many foremen look at new men in the light of producers only, entirely forgetting that there is a human side to every man under them which must be studied in order to get the best that man is capable of producing.

When we consider that the foreman's job is primarily that of a teacher and advisor, it is sometimes hard to understand why some of them will fire a man at the first sign of either disobedience or lowered efficiency, never figuring that if they just did their duty by having a heart to heart talk with the man a good many times he would be kept.

Many men who in the end turn out to be the best and most reliable workers are those who required coaching and tactful handling when new on the job. I can speak from experience when I say that several of my best men seemed hopeless at first because of difference of opinions and lack of information. Any show of passive resistance in the beginning was quickly abandoned, however, when they learned that I took a genuine interest in them and wanted to clear the way to mutual understanding. This understanding was not brought about by giving in or submitting to their wishes, but by judicious and careful explanation of the company's policies and the things that were required of them in their jobs.

—Frank Walgenbach, *Foreman, Buffalo Forge Company.*

The Wail of the Weak

In plant after plant I have heard, "Oh! the system will take care of that." It will, just as a coffee grinder will take care of the coffee beans. Brain power for the system and motive power for the coffee grinder must be provided by a human being. The man, clerk, foreman, superintendent, or manager who realizes that system can do its part, but is dependent on each individual using at least part of his brains, will make better than a fair success of his job.

Co-operation is a deterrent only to the individualist who should never go higher than operating a one-man farm or a one-man machine shop. I have found two ways of obtaining quick results. The first and most pleasant is through actual co-operation of the various departmental foreman; failing in this because of cantankerous personalities either in the shop or at home, I resort to competition. Competition is getting one foreman working to flood the next foreman's department with work; then getting the latter foreman working to keep caught up and prodding the first foreman for parts or work to process. This has given me good results in the marble, machine tool, small tool, textile machinery, paper machinery, farm machinery, and textile industries. Co-operation first, then try competition, after that a wholesale house cleaning of foremen.

The boss was partly right when he mistook arbitration for co-ordination. Any executive will acquire facts and figures, the experience and opinions of his foremen, and try to feel their probable reactions before finally making an important decision. If we take for the definition of arbitrate, "to hear and decide" and of co-ordinate "equal in rank or order," there is then an arbitrary balancing or equalizing effect obtained. Thus the boss uses arbitrary power in co-ordinating departments.

Al is wrong in saying co-operation is industrial charity. A man with that viewpoint is a "one-pointer" who cannot be taught any more about his industry or all industry in general. He knows it all and the company has wiped out another liability when his last salary check has been written. We cannot all be the best man on the payroll, otherwise there would be one standard salary and one standard job which anybody and everybody could fill acceptably. —E. E. Gagnon, *Superintendent, Raybestos-Manhattan, Inc.*

The Worm Turns

One reason for the dislike of welfare work in some shops is that there are too many petty details. Another trouble is that paternalism creeps in, with a slight hint of compulsion. The trouble may not be with the management, but rather with an over ambitious welfare director.

Ed's claim that many men would like to work in a dirty shop does not sound just right. It is of course possible to go to extremes, but such cases are rare. It was my experience recently to talk to an old time mechanic on things along these lines. He said that the best shop he ever worked in was a fairly small one. Here, every machine was perfectly clean, no tools were allowed on the machine ways, all tools in the crib were kept sharp and to size, each man had a stool and spitoon, chips were properly taken care of, floors were clean, and windows allowed a maximum of daylight to enter. The spirit that the work should be correct was preached, and could be expected from such surroundings and equipment. This form of welfare work, if it can be called that, is never resented. —L. F. Swenson.

The Community Fund

Charities have to be vigilant against attempted imposition. That too often has bred a hostile attitude toward all charities, whether deserving or not. When funds are solicited, the "tight wad" capitalizes this and other relatively unimportant incidents as an excuse to withhold a contribution, and to influence others to his narrowness. Who has not been warned in a whisper not to give because this or that society or church charity will get more than its share of the pool?

The community fund, rightly organized, is the most

intelligent means of solving a troublesome public problem and of saving waste in duplication. At its head it requires an individual of exceptional character and ability. This leader first obtains an impartial survey of the budgeted needs of each of the several units. Then he procures "cards-on-the-table" publicity, with services which public spirited newspapers, committees, speakers, and employers are glad to give. Employers help swell the total of collections by accepting "pay deduct" orders for a reasonable amount each week from employees who are convinced of the good purpose and effects of the community fund. —WALTER F. GILCREAS.

Under Cover

As Al says, on this touchy question, it all depends on the man receiving the reports. I have had experience with one firm in which it was generally understood that such a system of getting the "inside" information to the top was used. The staff were unaware of the class of information called for or of the discretion taken by the head in forming judgment and taking action upon such information.

The result was an unhealthy one. No member of the staff quite trusted another and all criticism of the efficiency and methods of the company was practically stifled except in jocular moments.

Nevertheless, I would adopt such a system to some extent if I were an executive head, but at the same time make an attempt to indicate to the staff at large the limited type of information I was prepared to receive.

—S. A. KNIGHT,
Irak Petroleum Company, Ltd.

Do Errors Cancel Each Other?

It seems to me that Joe actually made the mistake rather than the inspector, but in either case, he is still wholly responsible for work produced by him. This work being spoiled has cost him dollars and cents indirectly, as he will have to make one hundred more gears to replace those spoiled, and these new gears will also have to stand the loss of those spoiled, thereby, sending his costs sky high.

If Ed sees this in the proper light and tries to cultivate his mind in the channel that the man made the mistake, not the company or the inspector, his errors will be less.

—W. F. RICE, *Foreman,*
Pratt & Whitney Aircraft Company.

From Another Angle

Mechanical drawing is the universal language of the engineer, and blueprints are the printed pages of that language. The drawings should not be considered the main thing, merely a means toward an important end. They record the condition desired in the finished part for the use of the workmen and other interested parties.

Most drawings are made in third angle projection. This seems to be the correct way, since it is the natural method of looking at any object. Drawings should contain full information for the kind of work to be done. Working drawings for the shop should not have information pertaining to the patternmaking or forging, as the shop cares nothing about the pattern or forging processes except that the casting or forging will be machinable and will answer the purpose. All dimensions should be positively and clearly shown in a comprehensive connected manner. Tolerances must be shown in such a way that no doubt can arise as to what is wanted in the finished piece. This can be done only by showing the exact limits in positive figures. Unless the drawings are to be exhibited as works of art, all unnecessary work should be omitted as a matter of economy. The time spent in drawing screw threads, gear teeth, tapped holes, and similar things on working drawings is practically wasted. A note stating the specifications of these is ample coverage. When drawn in full, the shapes add only to the artistic appearance of the drawing and serve no really useful purpose. They can not be used directly for comparison and must always be accompanied with explanatory notes, so why not use notes and eliminate the useless fancy frills.

—L. O. BROWN.

No Parking

The parking of automobiles is a problem that is growing more acute each day. It therefore behooves the employers of labor to provide suitable places for employees to park cars. The problem is not one of expense, but of space.

In this day and age it would be unwise not to recognize the responsibility of the employer in providing parking space. If an employer wishes the full co-operation of satisfied employees, he certainly should provide means for parking their cars just as he provides space to hang their coats and hats.

The parking space problem is an easy one for a new factory that is drawing up plans, because in that case suitable space can be provided, but when it comes to the old business that is still located in the heart of a city, with no available room on the property for the cars, it is difficult to decide just where to put them. Some place must be provided and the plan in that case would be to rent a nearby lot which could be used for the purpose. Depending upon the resources of the manufacturer, either a building, shed, or open lot would be suitable.

—H. EZRA EBERHARDT, *Gould & Eberhardt.*

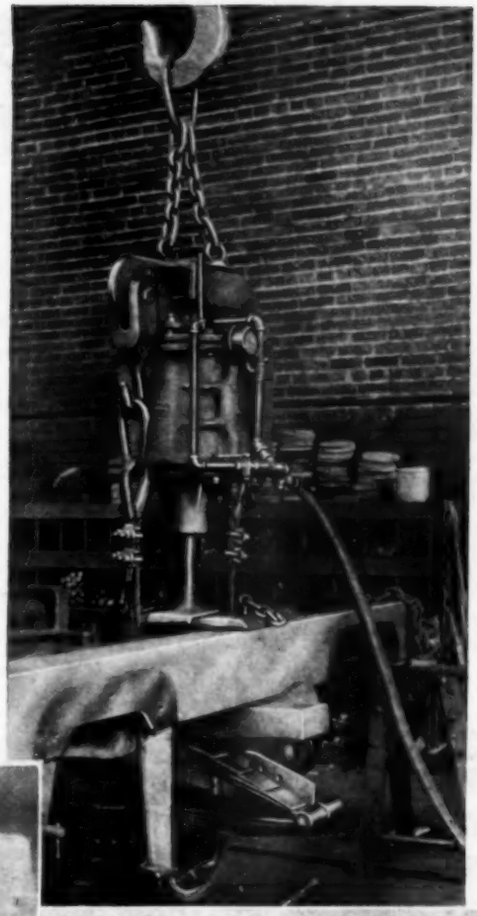
The Worm Turns

It would seem but the part of wisdom to discontinue welfare work in the plant when such work is unpopular with employees. Some workers always view with suspicion the good intentions of the management. They reason that the company must have some ulterior motive. Some even will point out disadvantages of certain welfare systems, and even resent what they feel are intrusions, tending to restrict and confine them. Naturally, under such conditions, welfare work, however expensive, is a comparative failure, and only tends to increase the overhead.

Another point to bear in mind is that, although a given welfare project has succeeded with one plant, it may prove an utter failure in another. When the management feels that welfare work fails to take, it is best discontinued. After all, it is the shop force that must be borne in mind. —FRANK V. FAULHABER.

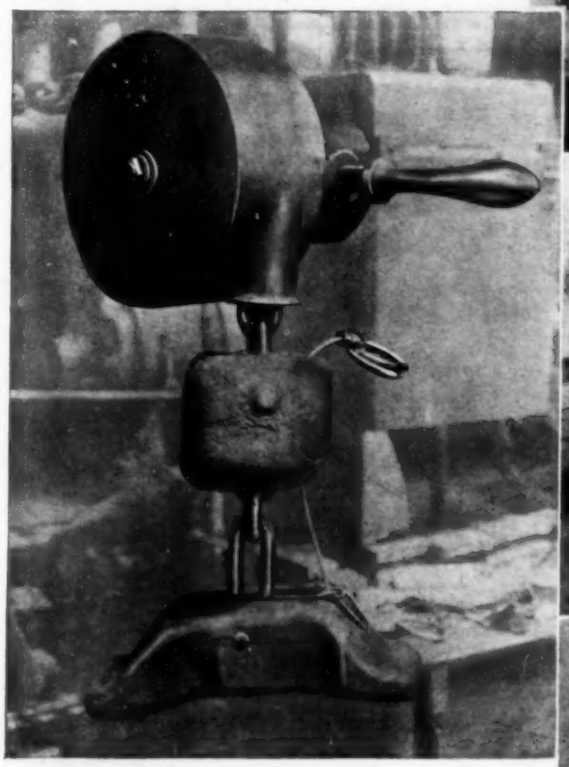
TRICKS in TRUCK AND WHEEL REPAIR

Omaha Shops, Union Pacific Railroad

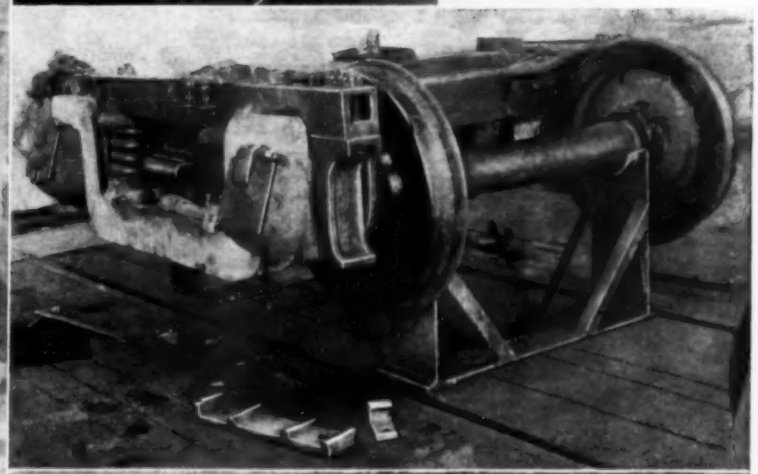


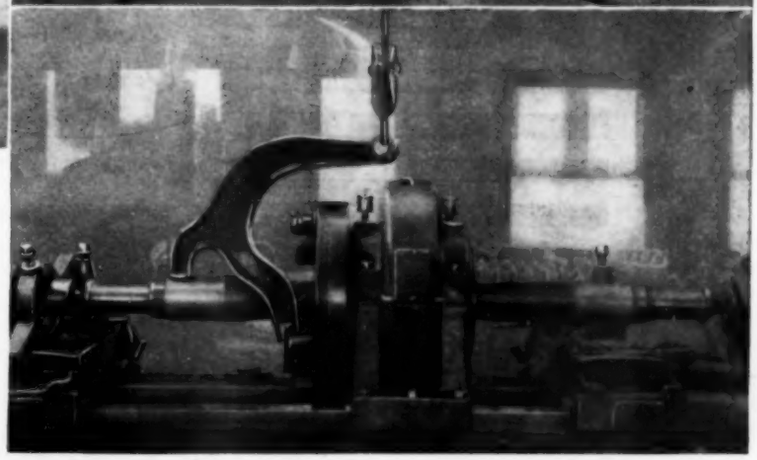
Jacking spring plank U-hangers in place by hand is a slow job at best. The pneumatic device, shown at the left, does the work in one-fifth the time

Assembly of tender truck frames is facilitated by the stands below. They raise the axles and frames far enough from the floor to make attachment of the binders and other parts easy



The wire draw string attached to the car wheel lifter, above, makes possible the release of the wheel without the operator's putting his hand under it as it rests on the boring mill table





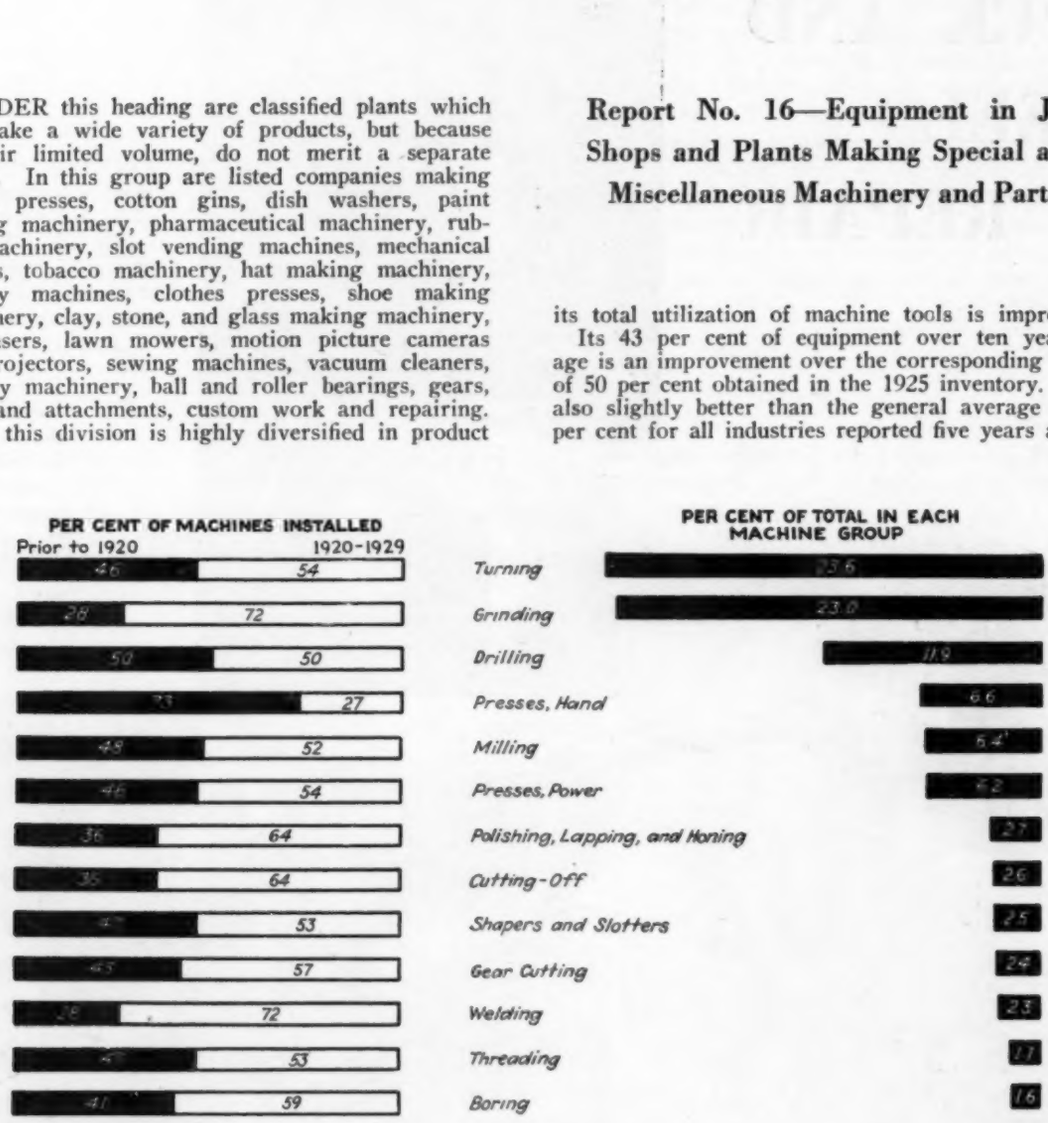
At the right is an efficient type of holder for handling axles in and out of the lathe by an air hoist on a monorail

AMERICAN MACHINIST 1930 INVENTORY
of Metal-Working Equipment

UNDER this heading are classified plants which make a wide variety of products, but because of their limited volume, do not merit a separate report. In this group are listed companies making baling presses, cotton gins, dish washers, paint making machinery, pharmaceutical machinery, rubber machinery, slot vending machines, mechanical stokers, tobacco machinery, hat making machinery, laundry machines, clothes presses, shoe making machinery, clay, stone, and glass making machinery, condensers, lawn mowers, motion picture cameras and projectors, sewing machines, vacuum cleaners, foundry machinery, ball and roller bearings, gears, parts and attachments, custom work and repairing. While this division is highly diversified in product its total utilization of machine tools is impressive.

Report No. 16—Equipment in Job Shops and Plants Making Special and Miscellaneous Machinery and Parts

Its 43 per cent of equipment over ten years of age is an improvement over the corresponding figure of 50 per cent obtained in the 1925 inventory. It is also slightly better than the general average of 44 per cent for all industries reported five years ago.



Job Shops and Plants Making Miscellaneous Machinery

	Total Number in Plants 1930	Number Installed Before 1930
LATHES		
Engine	15,821	9,022
Hand Turret	1,157	672
Power Turret	2,706	1,243
Automatic and Semi-Automatic	1,115	374
Chucking (Not Chucking Machines)	800	357
Speed and Bench	3,864	2,034
Crankshaft		
Toolroom Type	1,779	911
Other	1,379	1,013
CHUCKING MACHINES (Not Chucking Lathes)	3,455	264
SCREW MACHINES		
Hand	1,540	749
Automatic, Single Spindle	3,838	1,294
Automatic, Multiple Spindle	2,068	299
CENTERING MACHINES	366	196
MILLING MACHINES		
Hand (No Power Feed)	1,728	945
Bench	400	221
Plain (Knee and Column Type)	4,153	1,966
Universal (Knee and Column Type)	2,579	1,217
Vertical (Knee and Column Type)	766	272
Lincoln Type Manufacturing	306	147
Continuous, Rotary Table or Drum Type	94	60
Planer Type	162	94
Other	485	179
GEAR CUTTING MACHINES		
Rotary or Milling Type	1,030	579
Hobbing	1,157	647
Planing or Shaping	1,396	340
Other	366	136
BORING MACHINES		
Horizontal Boring, Drilling and Milling	1,038	366
Vertical Boring Mills	1,251	672
Other	204	34
JIG BORERS	153	9
DRILLING MACHINES		
Radial	2,392	1,132
Upright, One Spindle	9,493	4,877
Upright, Two or More Spindles	1,983	1,064
Upright Gang (Two or More Heads)	638	77
Sensitive, One Spindle	3,779	2,145
Sensitive, Two or More Spindles	570	306
Sensitive Gang (Two or More Heads)	111	17
Two, Three and Four Way	17	
Other	860	247
THREADING MACHINES		
Single Spindle Tapping	732	272
Multiple Spindle Tapping	281	111
Pipe Threading and Cutting	655	332
Bolt Threading and Cutting	655	357
Thread Chasing	247	136
Thread Hobbing and Milling	162	94
Thread Rolling	43	26
Other	94	26
PLANERS		
Open Side	613	315
Double-Housing	1,932	902
SHAPERS		
Vertical	340	170
Horizontal	3,583	1,651
Slotters	307	162
KEYSEATING MACHINES	1,021	570
BROACHING MACHINES	272	102
GRINDING MACHINES		
Plain Cylindrical	2,962	1,396
Universal Cylindrical	*1,481	604
Surface, Reciprocating	1,600	621
Surface, Rotating	1,157	460
Internal	3,651	264
Crankshaft	*102	
Cutter	1,643	545
Floor, No Feed Attachments	3,260	1,567
Bench, No Feed Attachments	1,498	519
Abrasive Disk	928	392
Abrasive Belt	460	281
Centerless	1,106	332
Other	18,554	3,906
POLISHING AND BUFFING MACHINES (Including those in Plating and other Depts.)		
Abrasive Wheel, Hand Operated	1,958	996
Abrasive Belt, Hand Operated	306	145
Automatic and Semi-Automatic	77	43
LAPPING MACHINES	2,009	417
HONING MACHINES	119	9
CUTTING-OFF MACHINES		
Parting Tool Type	102	43
Power Hack Saw	2,706	885
Rotary Cold Saw	715	340
Bandsaw	502	187
Other	247	94
WIRE FORMING MACHINERY		
Spring Coiling	272	187
Other	485	119
WELDING AND CUTTING MACHINES		
Resistance Welding, Butt	34	9
Resistance Welding, Spot	672	434
Resistance Welding, Seam	17	
Resistance Welding, Other	60	
Arc Welding	945	111
Electric Cutting	26	
Gas Welding	1,268	264
Gas Cutting	732	221
RIVETING MACHINES, STATIONARY		
Pneumatic	119	34
Hydraulic	204	85
Power	809	255
PRESSES		
Punching Machines	468	221
Combined Punches and Shears	732	392
Hand, Arbor	3,472	1,677
Hand, Light Punch Press Work	979	119
Foot, Light Punch Press Work	6,528	6,187
Power, Crank Type	7,115	3,464
Power, Toggle Type	221	68
Power, Double Acting	255	179
Power, Dieing Type	60	
Power, Trimming Presses	162	43
Power, Forcing, Arbor, Wheel	315	77
Hydraulic, Bending, Forming, Drawing	298	102
Hydraulic, Wheel Forcing, etc.	315	128
Baling, Power and Hydraulic	9	
Other	451	162
BENDING AND STRAIGHTENING MACHINES		
Bending Brakes	392	77
Bending Rolls, Horizontal	552	281
Bending Rolls, Vertical	26	17
Straightening Rolls	85	26
Other	213	119
SHEARS		
Knife	911	519
Rotary, Slitting	417	184
NIBBLING MACHINES	85	9
HAMMERS		
Drop	247	43
Helve	51	43
Spring	187	128
Steam	306	162
Pneumatic (not portable)	43	17
Other	119	68
FORGING MACHINES		
Bulldozers	34	34
Hot Forging Machines	681	34
Cold Headers, Bolt, Nut, etc.	460	145
Cold, Swaging	85	43
Forging and Flanging Presses, Hydraulic	26	17
Other Forging Machines	77	43
Total	167,096	71,989

IDEAS FROM PRACTICAL MEN

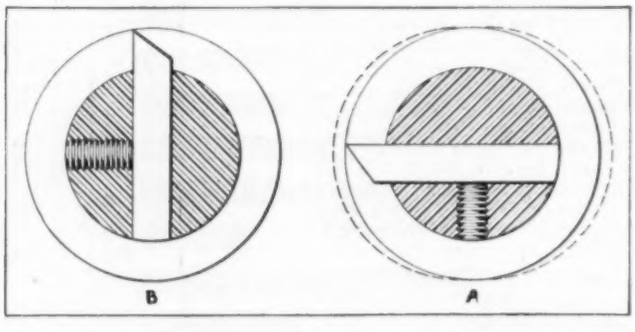
Counteracting the Index Error of Turrets

GORDON TOLLEY

IN BORING in the turret lathe, we had difficulty in holding the sizes of the holes to the required tolerances. Different types of tools were tried without helping matters. We finally checked the turret of the machine and found that it was out from 0.005 to 0.008 in. at each indexing. Since errors in indexing are common to all turret lathes after considerable use, we decided that the errors must be compensated for in the tooling.

The boring bars had been held in the turret so that the cutters were horizontal, or parallel with the plane of indexing, as shown at *A* in the illustration. With the cutters in this position, any error in indexing, or any looseness in the locking mechanism of the turret, would result in the holes being bored not only out of size, but out of round as well, the latter condition being indicated by dotted lines.

By holding the boring bars in the turret so that the cutters were vertical, or at a right angle to the plane of



indexing, as shown at *B*, both the error of indexing and any looseness in the locking mechanism were compensated for to a great extent. The holes were bored nearly enough round and within reaming size for our purpose. For reaming, the reamers were, of course, held in floating holders.

An Improved Button Arbor

GEORGE WILSON

In the illustration is shown a convenient type of button arbor for locating work in the milling machine for accurate boring. The ordinary button arbor has a tapped hole for the button screw, making it sometimes difficult to true the button, as the screw will tip and bind.

To obviate this difficulty, the arbor illustrated has a threaded stem to reach through the button, the diameter of the stem being less than that of the hole in the button. On the threaded end of the stem is a slotted nut operated by a forked screwdriver. Between the nut and button is a washer that is a close fit on the stem.

The end of the button can be counterbored, so that the nut will be flush or below the end to permit the button to be brought close to the work. For a short distance,

the body of the arbor is of the same diameter as that of the button, permitting the button to be approximately trued before using the indicater. The balance of the arbor is increased in size for the sake of stiffness.

Change Gears for Gear Cutting

JOHN THOMAS

Some time ago we had occasion to cut 113 teeth in a 3 diametral pitch gear. To cut this number of teeth, it is usually necessary that a gear having 113 teeth be used in the change gear train. As we did not happen to have a change gear with this number of teeth and not wishing to lose the time necessary to make one, we cut the gear with approximately 113 teeth. The formula for finding the change gears on the gear cutter we used is as follows:

$$\frac{24}{\text{No. of teeth to be cut}} = \frac{\text{Teeth in Drivens}}{\text{Teeth in Drivers}}$$

Substituting for our gear of 113 teeth in the regular way the gear train would be:

$$\frac{24}{113} = \frac{24 \times 40}{113 \times 40} = \frac{\text{Drivens}}{\text{Drivers}}$$

Of course, any pair of gears having equal numbers of teeth could be substituted for the two 40-tooth gears. Now taking the original ratio $\frac{24}{113}$, we find that the decimal equivalent is 0.212389380.

It will be seen from the above that an exact ratio without the use of the number 113 is practically impossible. We can however, approximate this ratio rather closely, so closely in fact, that the total error is almost negligible. Omitting the calculations necessary to find the approximate ratio, we selected the following:

$$\frac{850}{4002} = \frac{25 \times 34}{58 \times 69} = 0.21239394$$

These change gears were on hand; they gave us 112.9976 instead of 113 teeth. As this is less than the exact number of teeth desired, the total error between

the first and last tooth cut will be 113 — 112.9976 = 0.0024 of one circular pitch. As the circular pitch of a 3 diametral pitch is 1.0472 in., the total error will be 0.0024 × 1.0472 = 0.0025 in., that is, the last tooth will be about 0.0025 in. too thick. The center of the disk cutter, when cutting the last tooth, follows a line which is 0.0025 in. short of where it would be had we used the exact train of gears. Not wishing the whole error to fall on one tooth, we took off one of the change gears when the gear was cut half way around and with the help of an indicator moved the gear blank in the proper direction one-half of the total error, thus distributing the total error between two teeth.

This gear was of course cut with a disk cutter as this method cannot be used with a hob; had this same gear been cut with a single thread hob, the hob would make exactly 113 revolutions to one of the gear. A certain point on the pitch circle of the hob must meet exactly a certain point on the pitch circle of the gear at each revolution of the gear. If the approximate train of gears had been used with a hob, the result would have been a helical instead of a spur gear. Fortunately gears with an unusual number of teeth do not turn up very often, but when they do the cost of making a special change gear is very often a dead loss, unless it can be charged directly to the job; this cannot always be done.

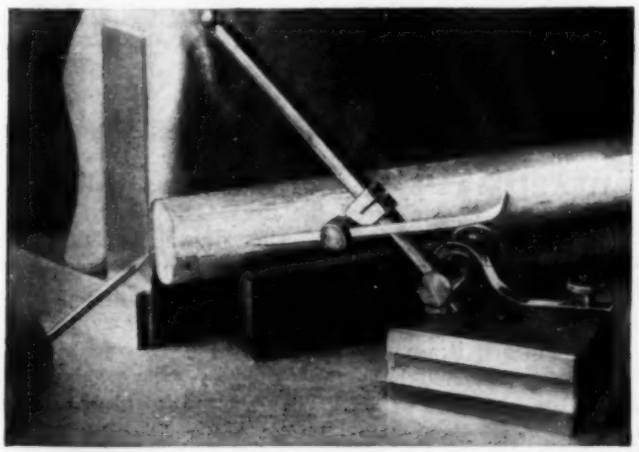
■

Scribing Opposite Lines on Shafts

HARRY MOORE
Hamilton, Ontario, Canada

To scribe two lines on a shaft diametrically opposite each other by ordinary methods involves a lot of guesswork, and too much time is usually consumed.

A simple and accurate method of doing the work is shown in the illustration, and since it eliminates the guesswork, it may be of use to some of the readers. The shaft is set in V-blocks, the scriber of the surface gage is set approximately to the center height of the shaft, and a horizontal line is scribed on one side of the shaft. Setting a square at the end of the shaft, a vertical line is scribed. The shaft is now turned one-half a revolution, or until the vertical line on the end coincides with the square blade. It is obvious that a horizontal line now scribed on the opposite side of the shaft, without disturbing the adjustment of the scriber in the surface gage, will be diametrically opposite the first line scribed.



How a Stamping Problem Was Solved

J. F. CAVANAGH
Mechanical Engineer

The following solution of a stamping problem may interest readers confronted with the fabrication of fiber parts. Phenolic fiber made under several trade names, but generally referred to as Bakelite fiber, was the material involved. The part resembled a half ring having a row of about 60 holes, 0.040 in. in diameter, near its outer edge. The difficulty arose from the close spacing of the holes. After considering various methods, such as multiple drilling and splitting the piercing operations, it was finally decided to pierce all the holes in one operation, utilizing a combination piercing and blanking die equipped with a spring-pad stripper.

After the job had been started, it was discovered that about one piece in five showed cracks between the holes, and it was plain that we were on the feathery edge of piercing limitation. How to insure uniformly good pieces was the problem. The makers of the fiber suggested warming the fiber before fabricating, but further than this they could advance no definite information. Warmed stock did show a slight improvement, and it then occurred to me to so arrange things as to obtain the greatest possible advantage from the effect of temperature.

A small reflector-type electric heater was placed so it kept the tools warm, and a large shallow pan was set alongside of the press on an electric hot plate. Ordinary machine oil was placed in the pan and the plate was adjusted so it would maintain a temperature of 150 deg. F. in the oil. The strips of fiber were immersed in the heated oil and were then fed into the press. Not only did defective pieces become a thing of the past, but the general quality was greatly improved. The 150-deg. temperature was determined by trial to be most satisfactory in this instance, but other stamping operations involving stock of different thicknesses may call for a change. The satisfactory results in this case were evidently due to the effect of proper temperature uniformly controlled, and to the thin lubricant.

■

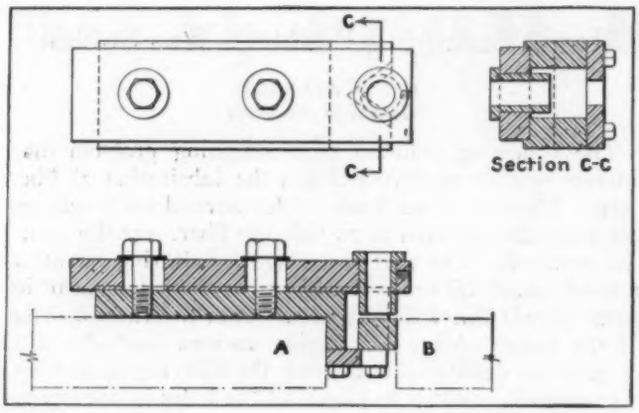
Drill Jig for Small Round Work

HAROLD F. KARRENBAUER

Since our shop is not of the production type, automatic machinery is not available, hence the drill press is used for a great deal of work that would otherwise be done on an automatic turret lathe in a well-equipped shop.

A jig for drilling small work, such as bushings and rollers, is shown in the illustration. It is held in the drill-press vise, the stationary jaw of which is indicated by *A*, and the movable jaw by *B*. The jig body is turned down at a right angle at the end, and carries a shelf on which the work rests, the end being cut out to form a V-block to center the work. The bushing plate is attached to the body by two screws, the clearance holes for which are elongated so that the plate can be adjusted endwise.

This construction permits the bushing to be brought over the center of work of different sizes held in the



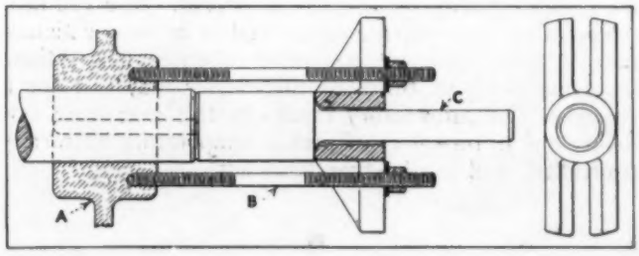
V-block. By tightening the vise, the movable jaw contacts with the work and holds it in the V-block. The shelf on which the work rests has a V cut in it to permit the drill to pass through. Loosening the vise, of course, releases the work from the jig. A steady flow of coolant speeds up the drilling.

■

Puller for Gears and Couplings
Discussion

J. T. Towlson
London, England

The puller described by H. J. Burnham, on page 997, Vol. 72, of the *American Machinist*, should not pass without notice, for the reason that, although rejecting the "primitive" puller as unsuitable for his purpose, Mr.



Burnham has gone a long and expensive way toward specialization, and with little or no advantage. In fact, I contend that his special puller will not be found so suitable as the primitive pulled illustrated herewith.

The hub of the gear to be pulled is indicated at *A*, and is drilled and tapped for the studs *B*, which extend through the slotted flange at the right. This flange is extra strong, and its slots permit considerable variation in the center distances of the studs, because of the difference in the sizes of the bores of the gears to be pulled. At *C* is a casehardened ram to be struck by a hammer when the studs are in tension. The smaller part of the ram is $\frac{1}{8}$ in. less in diameter than the bore of the flange. The larger part has the same clearance in the bore.

The puller described by Mr. Burnham is more expensive and is not so robust and durable as is this primitive puller. The pressure flange is by no means calculated to withstand the strain associated with the pulling of tight gears, and the large diameter of the pressure screw is surely a departure from correct design.

SEEN AND HEARD

•

Standardization in 1868

"YOU TALK of standardization," said an oldtimer. "Let me tell you of a really standard bit I ran onto in the Nineties. It was a planer that had come in for repair—in 1893, I think it was. It had been built back about 1867 or '68, just after the Civil War, and the ways were of such soft iron you could scrape them with a knife.

"Well, sir, that planer needed a complete overhauling—which we proceeded to give it. A couple of weeks later I had a wire from the owner, asking when we could deliver the planer. Andy, shop foreman, figured he could give it to me about Wednesday of that week, information which I promptly wired the owner. Well, Wednesday came and went—and no planer. So did Thursday, and Friday. Saturday morning I hunted up Andy for an explanation. 'Do you know what,' said he, 'That double-darned planer won't be outa here fur a week yet! When we tore her down, we chucked all her capscrews into a keg, and poured oil over 'em, just like we always do. When we started to assemble the thing again, we found that every darned capscrew was different—either wouldn't go, or went too far. They must have turned 'em screw by screw from bar stock as they needed 'em. But somebody forgot to number 'em as they went in. Now we gotta sort 'em out as we go—and you know yourself what a hell of a bunch of capscrews go into one planer!'" —*T.*

•

Pressure Oiling on Planers

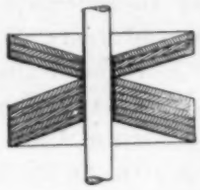
PLANERS have changed a lot since the old days of squeaking belt drives and squirt cans. The squeal of the shifting belt and the drizzling of oil on the planer ways were part of the penalty of using a planer in days gone by. Now the reversing motor drive has become standard practice evenly on fairly small planers, and the squirt can has gone the way of the shifting belt. Oil is forced to the planer ways to take the place of the old uncertain drizzle, and by increasing the oil pressure the table pressure on the ways can be partially overcome to reduce wear, even with the heaviest loads. And when you get a table that weighs 50 tons, without any work load on it, bearing pressures under load must be considered.

•

A Shop Laundry

I HEARD of a shop the other day where a washing machine and a helper saved the firm a tidy sum, in fact paid for the washer in six months. It was a plant where the men all wear the same kind of uniform, supplied and laundered by the firm. The washing machine cut the laundry bill in half. Even where the firm does not furnish overalls, it might pay the men to put in a small co-op laundry and have their own overalls washed. It would save a lot of backaches for Mrs. Machinist at home. —*J. R. G.*

Belleville Spring Washer Table



SINCE the publication of an article on page 211, Vol. 73, regarding Belleville spring washers, a number of requests have been received for further information. These washers are used on the Continent in place of helical springs. Combinations obtained by nesting them allow any load within reason to be taken, without alteration in the diameter, and in many instances, the length, of the spring formed.

Press tools for the manufacture of this type of spring washer are described on page 211, and the load required to flatten various sizes is there tabulated. On page 710, Vol. 73, the composition of a typical spring material is given, together with directions for fabrication and heat-treatment. Here is presented a table of properties of 133 sizes of washers, from 300 M. M. in diameter to the smallest in common use, 25 M. M. Since manufacturers making this type of spring size them according to the metric system, that sizing is here given, but may be converted by using the factor: 1 inch = 25.4001 millimeters. All results are tabulated from metric-size springs of the composition given on page 710.

In the table, outside diameter, thickness, hole diameter, and height are in millimeters, pressure in tons, and the weight in pounds or ounces, pounds down to 120-m.m. outside diameter 3-ton washer, and ounces below it. Height refers to height of dome excluding thickness of stock. Pressure is the flattening load.

Outside Diameter	Thickness	Hole Diameter	Height	Pressure	Weight
300	20.0	100	5.0	60	22½
280	17.0	86	5.3	40	16
	17.0	80	5.3	40	15½
	16.5	80	5.4	35	15¼
	16.0	80	5.5	32	15
	14.0	86	5.8	25	13
	12.0	86	6.0	20	11
	10.0	86	6.8	16	9¼
250	15.0	70	5.0	23	11
	14.7	70	5.0	22	11
	10.0	90	6.0	14	7
	8.0	90	6.5	9	5½
220	11.0	60	5.4	22	6½
	10.5	60	5.5	18	6
204	10.0	90	4.6	15	4½
	9.3	56	5.2	13	4½
	9.0	90	4.8	10	4
	8.0	50	6.0	8	4
	7.0	56	6.2	6	3½
200	10.0	54	5.0	15	5
180	10.0	60	3.8	13	3½
	9.0	50	4.0	10	3½
	8.0	60	4.7	8	2½
	6.0	50	6.3	5	2½
170	10.0	36	3.5	18	3½
	9.0	36	4.0	12	3½
	6.5	68	5.0	5½	2
	4.0	60	6.0	1½	1½
165	8.0	45	4.2	9	2½
	7.5	42	4.2	8½	2½
164	10.0	36	3.5	18	3½
	19.5	36	3.7	15	3½
	9.0	36	4.0	13	3
	8.75	80	4.0	11	2½
	8.0	45	4.2	9	2½
	6.0	46	5.3	6	2
	7.0	42	4.0	8	2½
160	7.2	48	4.0	8½	2½
	7.2	60	4.0	8	2
	7.0	56	4.0	7½	2
	6.8	71	4.0	7	1½
	6.5	52	4.5	6½	2
	6.0	71	4.2	5	1½
	6.0	60	4.5	5	1½
150	7.0	56	3.8	7½	1½
	6.5	38	4.0	6½	1½
	6.5	50	3.8	6½	1½
	6.2	61	3.8	6	1½
	6.0	50	4.0	6	1½
	6.0	61	4.0	5	1¼
140	7.0	36	3.0	6	1½
	6.2	41	4.0	8½	1½
	6.0	45	4.0	8	1½
	6.0	60	3.5	4½	1½
	5.0	41	4.0	4	1
	5.0	36	4.0	4½	1½
	5.0	45	4.0	3½	1½
	5.0	60	4.0	3	1
	4.0	60	4.2	2	½
130	12.0	36	2.0	22	2½
	11.0	36	2.3	20	2½
	10.0	36	2.5	18	2
	6.2	40	3.0	6	1½
	5.4	36	3.1	4	1½
	5.0	47	3.3	3	1
	5.0	39	3.3	3½	1
	5.0	26	3.5	6	1½
	3.5	56	4.0	1½	½
	3.0	53	4.0	1½	½
120	6.0	48	2.8	5½	1
	5.0	36	3.3	3	1
	5.0	42	3.3	5	14 oz.
	5.0	39	3.3	3	14
	5.0	37	3.3	3	14
	5.0	45	3.3	3	14
	4.0	40	3.5	2	13
	3.8	45	3.6	1½	9
	3.8	37	3.5	2	10
	3.0	30	4.0	1	8
115	6.0	48	2.6	4½	14½
	5.0	45	2.8	3½	12½
110	6.5	52.5	1.5	8	13½
	4.0	41	2.8	12	9
100	10.0	36	1.3	1	19
	8.0	36	1.8	9	15½
	6.0	40	2.2	6½	11
	6.0	36	2.2	7	12
	5.0	30	2.5	5	10
	5.0	31	2.5	5	9½
	5.0	36	2.5	5	10
	4.8	27	2.5	3½	9½
	4.8	36	2.5	3½	8
	4.7	46	2.5	3	9
	4.5	30	2.8	3	9
	4.5	26	2.8	3	9
	4.0	30	3.0	2½	8
	4.0	40	2.8	2½	7½
	4.0	22	3.0	2½	8½
	4.0	27	3.0	2½	8½
	3.8	36	3.0	2½	7½
	3.0	26	3.2	1	6½
	3.0	27	3.2	1	6½
	2.0	20	3.5	½	4½
90	5.5	25	1.8	4½	9
	5.2	25	1.8	4½	8½
	5.0	25	1.8	4	8½
	4.5	26	2.3	4½	7½
	4.0	27	2.3	2½	6½
	4.0	32	2.3	2½	6½
	4.0	26	2.3	2½	6½
	3.0	26	2.8	1½	5
	2.5	26	2.8	½	4
80	7.0	26	1.0	7½	8
	5.5	25	1.5	5	7
	5.0	27	1.5	4½	6½
	4.3	27	1.8	2½	5½
	3.7	36	2.0	2	4½
	2.5	20	2.2	1	3½
80	2.5	34	2.0	½	3
	2.5	30	2.0	½	3
	2.5	10	2.4	½	3½
70	5.0	26	1.3	4	4½
	3.8	27	2.0	1	3½
	3.0	25	2.1	1½	2½
66	3.0	33	1.4	1	2½
	2.0	33	1.5	½	1½
60	2.5	20	1.5	1	1½
55	3.0	24	1.4	½	1½
	2.0	16	1.5	½	1½
50	2.2	20	1.3	½	1
32	3.0	10	0.8	1½	½
	2.0	10	1.2	½	½
25	1.5	12	1.0	½	½

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American Machinist

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Politics

TO THOSE who still have illusions of the inherent integrity of mankind the talk of nonpartisan co-operation in Washington during the present Congress is gratifying. To those who are disillusioned it is largely a matter of indifference. But, regardless of one's position in either of these groups, it is becoming clearer as the session gets under way that the leaders of both parties are going to have trouble keeping their cohorts in column.

In the peculiar political situation that exists today the voice of the man back home will be heard farther than usual. Which is fortunate, because unless this important individual raises his voice against political chicanery in a national crisis that is just what will occur.

Senators and representatives alike have frequently expressed a desire to hear from their constituents. That desire should certainly be gratified this winter.

Apprentice Training for the Future

APPRENTICE training, together with other personnel work, is usually relegated to the background at the first sign of business recession. For this reason the two papers on apprenticeship presented at the annual meeting of the A.S.M.E. are of particular interest as indicating that executives are considering the future need for skilled men.

One paper advocates that the problem be considered from its effect upon the community and on industry as well as upon the individual. To this end it suggests that apprentice training become a general institution in as many plants as possible, with some sort of co-ordination rather than a haphazard training by random employers.

We shall need more trained men to carry on the highly specialized industries. Now is a good time to study the probable requirements and the best way of giving the required training.

Technical Teaching and Research

IN THE long run, which theory leads to the best results for the community at large—the acquisition of practically all of the most brilliant technical minds by industry through the paying of considerably higher salaries, or the concentration of these minds in the technical schools and universities where a certain share of their time and energy can be devoted to teaching?

The question is prompted by an address delivered at the Lehigh University conference on the relations between industries and the technical schools in October. The address was delivered by President William E. Wickenden of Case. It was based on his study of the practice in the technical schools of France, England, and Germany.

Mr. Wickenden attributes the rapid industrial rise of Germany to the achievements of the research men in her schools and universities. He points out that the occupant of a university chair has, in addition to a reasonable stipend, so many perquisites and such a high professional standing that a German engineer or research scientist looks upon a call to a university chair as the highest honor, and so practically never refuses it.

In the United States, generally speaking, the reverse of this situation is true. Most college men look upon the securing of a fat industrial research job as a stroke of good fortune. And who can blame them when such a position brings relief from dull classroom routine, ample facilities for carrying on research, and freedom from economic worry? We have here no compensating prestige or privilege to offset the financial attractions of industrial jobs. In fact, the tendency is to look down upon the college professor rather than to look up to him, which is hardly to be wondered at when one remembers that most of the better professors have been drawn into industry. The whole thing is a vicious circle that seems hard to break.

Our own traditions are so firmly established that there is little chance of engrafting upon them the German tradition, assuming for the moment that the German tradition is wholly desirable. But our industrial leaders should at least pause to consider whether some modification of our present practice might not lead to better results, in the long run. To arrive at such a conclusion would require a breadth of vision that some of them have not shown, but which is going to be essential to leadership in the future.

SHOP EQUIPMENT NEWS

Newton Three-Spindle Horizontal Boring Machine

Motor frames for electric locomotives are bored, counterbored, and faced in the Newton special three-spindle horizontal boring machine illustrated. This machine was built by the Consolidated Machine Tool Corporation of America, Rochester, N. Y. It consists essentially of a heavy bed plate on which are mounted three boring heads carrying the three boring spindles. Two heads carry the 10-in. spindles and are adjustable horizontally at right angles to the spindle travel, whereas the head carrying the 6-in. spindle is adjustable vertically.

The bed plate is provided with ways for the work table, the latter being provided with power adjustment in line with the spindle travel. Outboard supports for the boring bars are mounted on the work table, and are provided with horizontal and vertical adjustments to correspond with the boring head adjustments.

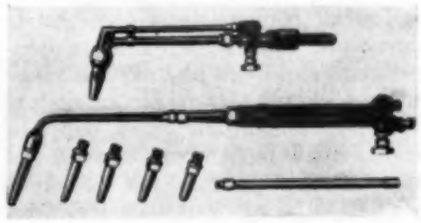
The machine is set up for boring and facing both sides and counterboring large fabricated welded steel electric motor frames. The entire roughing cut is taken with one pass of the boring bar traveling a distance of about one-third of the bore because of the multiple tooling employed. Finishing cuts are taken by single tools. Boring heads carrying multiple tools are mounted on each of the two larger boring bars. The multiple tools are of the swiveling, disappearing type, so constructed that all tools may be set to the exact diameter required when outside of the job. They are then swiveled and disappear below size, passed into the job, and then swiveled out again, thereby permitting the cut to be taken at the correct position in the job. Provision is made for setting the roughing and finishing tools exactly to size by micrometer adjustment.

Timken roller bearings and roller thrust bearings are used for the spindles, and herringbone gearing is used for the spindle drive. Control for the feed and rapid traverse is manipulated through air cylinders. Both hand and power independent adjustment is provided for each spindle. The spindles can be set independently so that any spindle may be stopped automatically at any point.

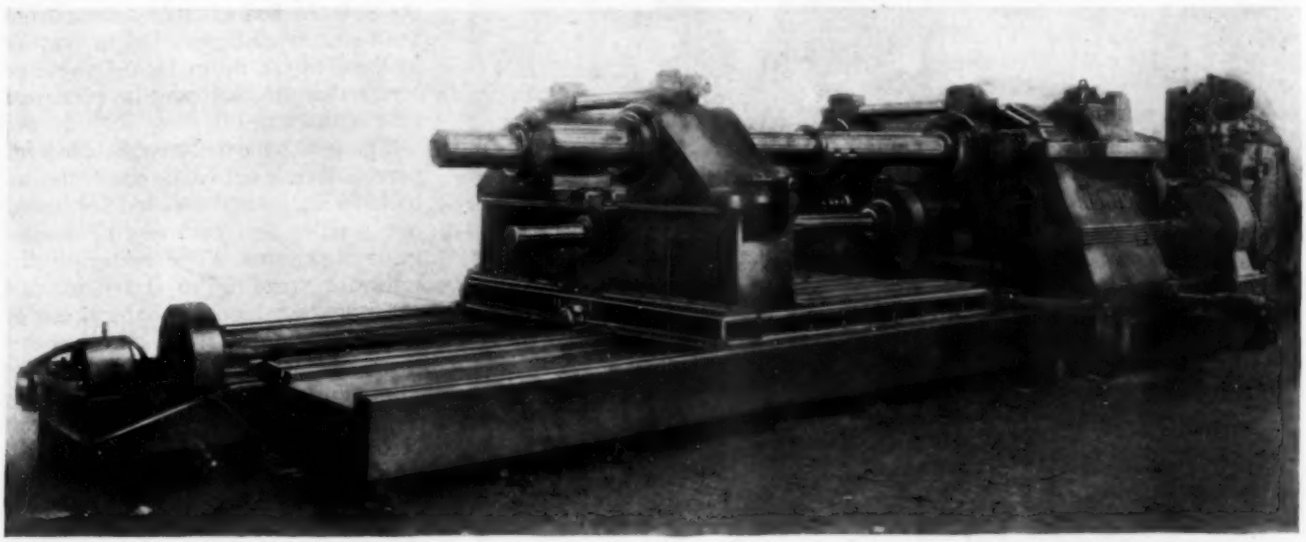
Independent drive is employed for each spindle, the two larger spindles each having a 35-hp. motor, and the smaller one a 10-hp. motor. Feed and rapid traverse are also independent to each spindle, three 5-hp. motors being used for these purposes. Power adjustment and traverse of the work table is through a separate 5-hp. motor.

"Meco" Type X "Super" Welding Torch

Lightness and balance have been incorporated in the design of the "Meco" Type X "Super" welding torch developed by the Modern Engineering Company, 4311 Pine Blvd., St. Louis, Mo., for general and heavy welding.



All types of torch accessories can be adapted to this unit. Variable-angle welding heads, extensions of 6- or 12-in. lengths, and all styles of welding tips are available, including



Boring and facing both sides and counterboring large fabricated, steel, electric motor frames is done on this Newton Three-Spindle Horizontal Boring Machine, which has a total of 100 applied horsepower

either X standard, XP gooseneck, or X-HD flexible heavy-duty tips. The torch has been designed to be non-flashing, at the same time being capable of producing a long neutral flame. On medium gas pressure, this is accomplished with a semi-injector universal mixing chamber.

The Type X torch may be adapted to low pressure by using a special low-pressure welding tip assembly and by changing the mixer in the cutting attachment. All styles of cutting tips can be used. In addition, four angle cutting heads are procurable of 90, 78, 45 and 0 deg., the 78-deg. angle head being furnished as standard.

Société Genevoise Universal Two-Co-ordinate Measuring Machine

Through their American agent, the R. Y. Ferner Company, Investment Building, Washington, D. C., The Société Genevoise d'Instruments de Physique, Geneva, Switzerland, is placing on the market in the United States a measuring machine for general use in inspection departments of industrial plants. It is arranged to carry out measurements in two co-ordinates, and can be used for measuring all kinds of workpieces, such as forming tools, profile gages, templets, cams, small jigs, thread cutters, and dies. Provision is also made for testing of thread gages, micrometer screws, worms and taps for pitch, angle of profile, and diameter by means of an optical method. Measurements may also be made of photographic negatives or prints or any type of recorded charts. The precision of the apparatus is embodied in two accurately graduated scales of nickel-steel alloy.

A heavy cast-iron bed supports the two slides, which move at right angles to each other on V and flat ways. The longitudinal slide has a travel of 16 in. by means of a rack and pinion. Fine settings are made by means of a worm and worm wheel drive. The slide carries a 16-in. precision scale read by a Société Genevoise high-precision micrometer microscope graduated to 0.00005 in. per division. This scale is divided to twentieths of an inch throughout its length, so that at least one division of the scale is in the field of view in any position of the table. A coarse scale with index is mounted on the front part of the machine bed for approximate settings.

The longitudinal slide has an opening to permit illumination from below. Pieces to be measured are not clamped to this slide, but to one of three interchangeable fixtures provided with the machine. One of these is a T-slotted work table measuring $19\frac{1}{4}$x$5\frac{1}{2}$ in., and used for laying out work by means of a punching tool and for general measuring work, or for the attachment of any special work-holding fixture.

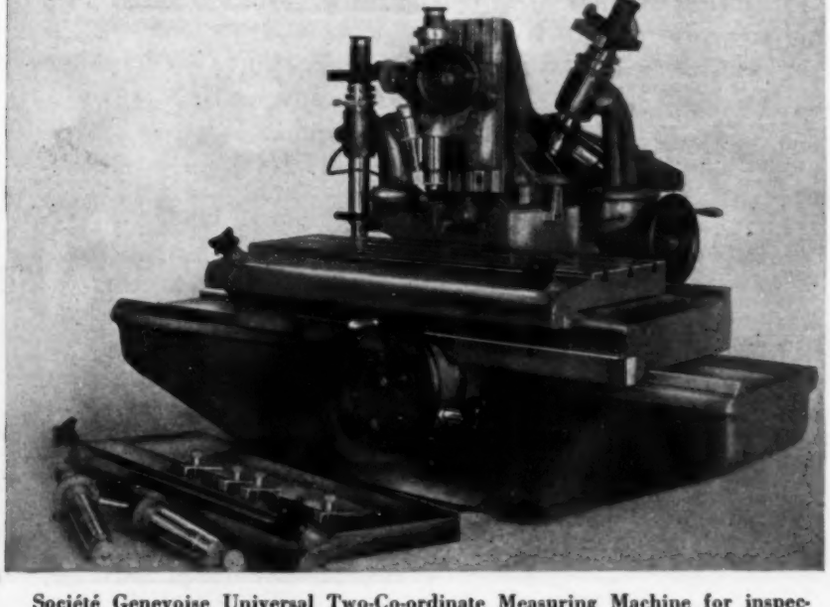
A second table can be bolted similarly to the slide and has a glass plate $16\frac{1}{2}$x$3\frac{3}{4}$ in. set flush in the surface over the opening. It is used for measurement of objects with illumination from below. Screw clamps are provided for holding pieces on this table.

The third fixture for attachment to the slide is a pair of center supports for the examination of pieces held between centers, such as micrometer screws, worms, and thread gages.

A transverse carriage, moved on its V and flat ways by means of a screw, serves to carry the sighting microscope for measurements in the other co-ordinate. The carriage carries a precision scale like the one on the longitudinal slide, and readings are made by a second micrometer microscope. The front part of the transverse carriage has a vertical slide on which the tool holder can be adjusted in height by means of a rack and pinion device. A locating or sighting microscope, a goniometric microscope, a punching tool, and a centering dial indicator device are designed to fit in this tool holder.

A device for illumination from below is carried by the transverse carriage, using a tubular piece extending through the bed of the machine from the rear. This beam of light may be inclined to the mean helical angle of screw threads that may be measured on the machine.

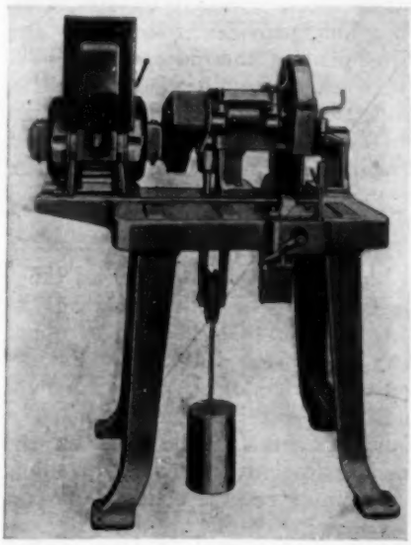
The punching tool may be used for precise laying out of jigs and dies up to 4x16 in., or may be used for laying out profiles and contours of special gages and cams. The centering dial indicator, reading to 0.001 in. and sensitive to a higher accuracy, can be used for aligning work or for measuring the distance between holes. The minimum free distance between the T-slotted table and the toolholder is 3 in., the maximum $6\frac{1}{4}$ in., while the distance from the table to the transverse carriage is $2\frac{1}{32}$ in. A 6-in. circular table, read easily to one minute of arc, is furnished extra for work with polar co-ordinates.



Société Genevoise Universal Two-Co-ordinate Measuring Machine for inspection of forming tools, gages, cams, and threads, and for laying-out

Campbell Abrasive Cut-Off Machine

One of the machines to be shown at the Power Show is the abrasive cut-off machine manufactured by Andrew C. Campbell, Inc., Waterbury, Conn. It is suitable for cutting steel, steel alloys, iron, non-ferrous metals, fiber, and other materials. Cuts are smooth and true, and the material is

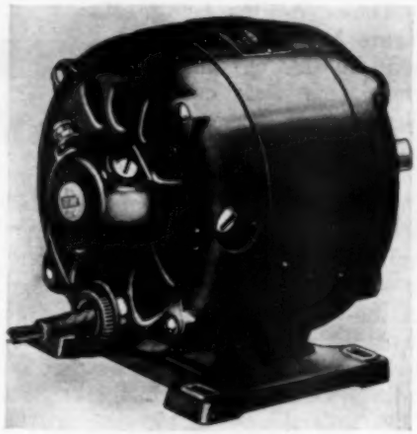


not damaged by heat. The work is held firmly in place by a fixture.

The handle for operating the abrasive disk is arranged so that the operator may use either hand in cutting the material. The starting switch is conveniently located on the motor. Belts and the disk are guarded to prevent danger of injury to the operator. All moving parts are balanced so that little effort is required to operate the machine. The bed is large and has finished foot pads for attaching fixtures for special production jobs. Such fixtures can be furnished. A positive V-belt drive provides smooth delivery of power.

Bodine Type N-5 Fractional-Horsepower Motors

The Bodine Electric Company, 2254 W. Ohio Street, Chicago, Ill., announces Type N-5 fractional horsepower motors, which will ultimately replace the older Bodine Types SA and SD motors. Two frame sizes of



Bodine Type N-5 Fractional-Horsepower Motor with wool-packed bearings

the Type N-5 are now in production, having ratings of $\frac{1}{20}$ and $\frac{1}{12}$ hp., respectively, at 1,125 r.p.m. and $\frac{1}{10}$ and $\frac{1}{8}$ hp. at 1,725 rev. per minute.

The Type N-5 frame is equipped with specially developed wool-packed bearings. A leaded bronze bearing is used and it is provided with double oil slots at the sides, giving double contact areas for the wool packing.

By using a larger fan and larger ventilating ducts on the stator, the ventilation has been increased considerably so that increased ratings for a given frame size range from 15 to 30 per cent as compared with the older Type SA and SD frames.

"Meco" Type A Straight-Line Oxygen Cutting Machine

A portable oxygen cutting machine designed especially for the average boiler and structural steel shop is being marketed by the Modern Engineering Company, 3411 Pine Blvd., St. Louis, Mo., under the name "Meco" Type A straight-line cutting machine.

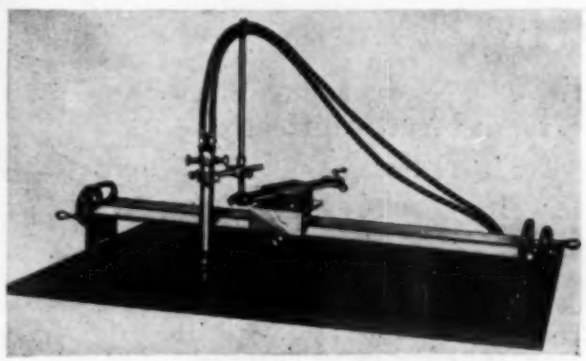
The machine consists primarily of a carriage having a cross-feed similar to the compound rest of an engine lathe. Longitudinal feed of 42 in. for the carriage is by handwheels at either end, and the cross-feed of the compound is also by hand. It is possible to make cuts at almost any desired angle as well as circular cuts with a radius within the range of the cross-feed movement, which is 7 in. Roller mounting of the carriage insures free movement in all positions.

The revolving movement of the cross-feed is graduated in degrees. A latch lever and half nut engaged with the longitudinal screw provides for a quick return of the carriage along the bed without the necessity of backing the screw. The machine is intended for use with the Type O machine cutting torch made by the company. In this torch a by-pass arrangement of the oxygen conduits provides for the use of either a two or three hose hook-up. The torch is adapted to take the standard line of Type L cutting tips, including the unit two-piece style. The approximate shipping weight is 80 lb.

Millimicro Comparator and Gage Blocks

A precision measuring instrument that is claimed to be accurate within half a millionth of an inch has been announced by the Millimicro Instrument & Gage Company, 20 West 22nd St., New York, N. Y. This device is mechanical and positive in its measurements and may be readily used by an inexperienced operator. A particularly advantageous feature is the speed at which gaging can be done as compared with other methods.

The instrument employs an adjustable, corrugated anvil to support the work. A vertical plunger carrying an extremely hard contact point is raised and lowered by a slight pressure on the operating lever. Motion of this point is transmitted to a pointer which is viewed through a



microscope. A scale on the object lens of the microscope measures the movement of the pointer. By changing the degree of magnification, the calibration of the device can be quickly altered from one line per millionth-inch to less sensitive readings. A reflector projects illumination on the scale as in other microscopic work. A screw at the top permits vertical adjustment between

Precise measurements may be made mechanically with this Millimicro Comparator

the microscope and the pointer. The entire measuring unit is supported on a rigid vertical post and is adjusted thereon by a split bracket for the initial settings. Minor adjustments to bring the pointer to a zero reading are made with the threaded anvil base.

This comparator is claimed to be well suited to checking the size and parallelism of flat surfaces such as gage blocks. Exact duplication of results can be obtained. It may also be used for round or spherical work by using different contact points.

The Millimicro Instrument & Gage Company is also offering sets of size blocks made by using the comparator.

Trent Electrical Heating Elements

Immersion-type, electrical heating elements have been added to the line manufactured by the Harold E. Trent Company, 439-43 No. 12th Street, Philadelphia, Pa. The Type IR Junior immersion unit is illustrated.

These heating elements have been constructed to be interchangeable with other elements of a similar character. The correct relationship between the area of the heating element and the outside casing has been determined in order to provide sufficient surface to radiate the heat generated in the element. The element can be replaced if desired. For example, either a higher or lower wattage or voltage element, or a change from a one- to a three-heat element can be made.

Trent Type IR Junior Immersion-Type Electric Heating Element

For stock purposes the element is supplied with a seamless brass tube, but bodies made of copper, steel, or chrome alloy steel are available. For the ordinary elements, the heat is distributed over the entire length, although when necessary heat concentration at different positions along the tube can be provided.

"Chicago" Steel Hand Brakes

Electric arc welding has replaced riveting of all rolled steel sections on the "Chicago" steel brakes manufactured by the Dreis & Krump Manufacturing Company, 74th St. and Loomis Blvd., Chicago, Ill. The leg design has been changed from angle bars to pressed steel sections, as shown. This adds to the strength, as well as improves the appearance and provides for cross bars in the legs for shelves for the formers. A new type adjusting link has been provided, eliminating the old eccentric adjustment. Adjustment is now made by a sliding block adjusted by setscrews. This link provides four times the adjustment of the old eccentric link, and is an important feature used in connection with special bending, where bars are required to be clamped in with the material to be bent, such as making internal and part sheet bends.

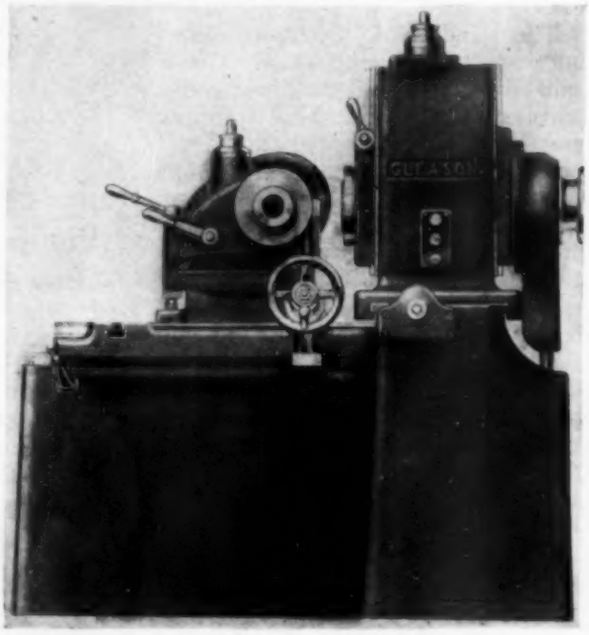
These steel brakes are now made in 24 standard sizes, in capacities ranging from 3 to 12 ft. long and capable of bending up to 12 gage. The upper jaw is adjusted forward and backward by means of setscrews for light and heavy materials and for sharp or rounding bends. The bars on the bending leaf are removable to allow for forming reverse bends as narrow as $\frac{1}{4}$ in. Provisions are made at both ends to accommodate work on which a crosswise flange has been bent. All sizes are furnished with a $\frac{1}{4}$-in. detachable steel bar or apron; an angle bar for heavy bending; an improved adjustable stop gage for regulating the angle of bends; five molding formers, clamps, and wrenches.

Electric arc welding is employed extensively on the Chicago Improved Steel Hand Brakes

Gleason No. 13 Universal Gear Testing Machine

Straight and spiral bevels with any shaft angle, hypoids, helicals, angular helicals, internal, herringbone and spur gears can all be tested on the No. 13 universal testing machine, announced by the Gleason Works, 1000 University Ave., Rochester, N. Y. The machine has capacity for gears up to 13 in. outside diameter. Gears are tested on this machine by running them together with or without load as desired. The load is applied manually by a brake operating on the driven spindle.

The frame of this machine is cast in one piece and is of heavy section. With the adjustments provided, it is possible to estimate the amount of change required in the settings of the cutting machine to provide the desired tooth bearing in the correct mounting of the gears. The driver or pinion spindle can be operated in either direction. It is mounted on a head which can be adjusted vertically on a column for obtaining the necessary offset of the pinion from the center of the gear. This adjustment is made with a lead screw while a dial graduated to show 0.001 in. indicates the setting. The column has a horizontal adjustment on the frame for testing angular gears with long cone distances. An overarm support for the pinion head is furnished.



Gleason No. 13 Universal Gear Testing Machine, which has capacity for gears up to 13 in. outside diameter

The gear or driver head has three adjustments. It is mounted on a slide that provides horizontal adjustment to take care of the mounting distance of the gear. This slide swivels on a base which permits an angular setting from 0 to 180 deg. It also has horizontal adjustment on the frame to provide for a change in the mounting distance of the pinion. Angular setting can be made to an accuracy of 20 seconds, while the two horizontal adjustments are made by means of lead screws with dials graduated to 0.001 in. Both heads can be clamped securely in any position if a quantity of gears are to be tested.

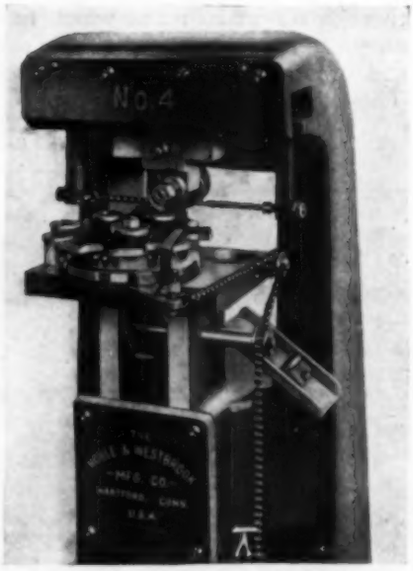
Both spindles are mounted on matched ball bearings with sufficient initial load to eliminate radial or axial deflection under ordinary operating conditions. Spindle noses are heat-treated, and all taper holes are ground with the spindles in place in their own bearings. The spindles are bored 2.292 in. in diameter at the large end with $\frac{1}{2}$ in. taper per foot for a depth of 6 in.

Drive is by 3-hp., 4-speed motor with reverse control. Two pulleys give the following spindle speeds; 400, 500, 600, 750, 800, 1,000, 1,200 and 1,500 r.p.m. Sight-feed oilers are provided for lubrication purposes, the oil being filtered before it reaches the bearings. Standard equipment includes the overarm support for the drive head and all gages, and tools. Arbors are not furnished.

Specifications: capacity, 13 in.; range of angles, 0 to 180 deg.; range of offset, above center, 8 in., below center, 2 in.; maximum center distance for spurs, worms and wormwheels, 8 in.; minimum and maximum positions of nose of drive spindle from cone center of gear to be tested, 4 and 10 in.; minimum and maximum positions of nose of brake spindle from cone center of gear to be tested —5 and +10 in., and net weight, 3,500 lb.

Noble & Westbrook Production-Type Trade-Marking Machine

An eight-station revolving table is employed on the special trade-mark embossing machine illustrated. This machine, developed by The Noble & Westbrook Manufacturing Company, 20 Westbrook St., East Hartford, Conn., was developed particularly for marking the escutcheon over the keyholes of locks with embossed, raised letters or designs. In this machine a cylindrical die travels from right to left in a cycle required to do the marking or embossing. The slide of the machine is operated by a motor mounted in the base, travel being effected through a rack and pinion. The die is controlled by a specially designed chain so that the travel of the die is always in the embossing position. This method allows the die



Noble & Westbrook Special Trade-Mark Embossing Machine

to start in any part of the stroke, and the best results are obtained by the die passing over the work a number of times.

Pressure is applied by a pedal. Release of the pressure indexes the die automatically to the next station and at the same time ejects the finished piece, which slides down a chute to a receiving box. The weight of the machine is 400 lb., and floor space required is 18x34 in.

Rockford Horizontal Multiple-Spindle Drilling and Tapping Machine

A multiple-spindle drilling and tapping machine with functions controlled hydraulically has been developed by the Rockford Drilling Machine Company, Division of Borg-Warner Corporation, Rockford, Ill. The hydraulic operation depends upon an arrangement of the Oilgear pump, and the operation of the machine through this control is such that clean cut threads are secured and danger of tap breakage is reduced to a minimum. For example, the double-end arrangement illustrated has been in operation for several months for drilling and tapping large tractor gears cases without tap breakage.

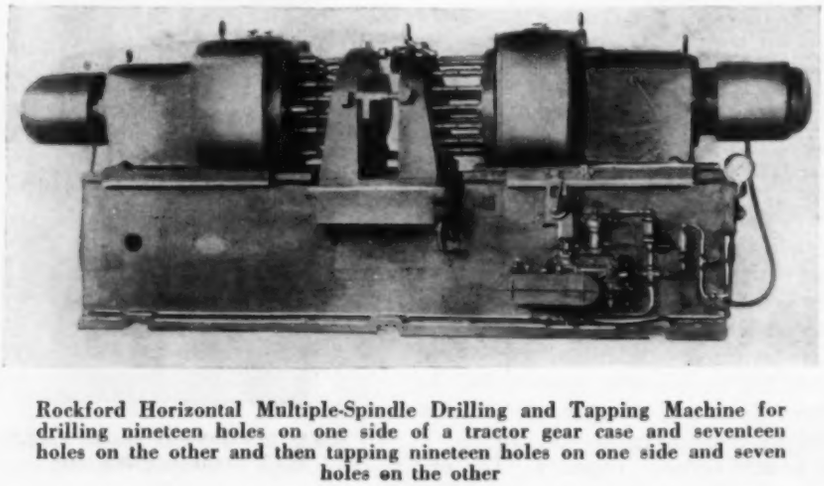
This particular machine has nineteen spindles at one end, and seventeen spindles at the other end. First, a batch of parts is run through the machine, having seventeen holes drilled on one side, and nineteen holes drilled on the other side, all simultaneously. Then the machine is set for tapping which is accomplished by positive engagement of levers, and the same batch of parts is again run through the machine, at which time nineteen holes are tapped on one side and seven holes tapped on the other. These tapped holes vary in size.

Each head is driven by a ball-bearing motor, the drive being through reduction gears to the main driver at the front compartment of head which accommodates the spindle unit. The revolving parts in the drive head proper are mounted in Timken taper roller bearings, and run in a bath of oil. By means of a clutch lever on each head, drilling or tapping speeds can be secured.

The spindles of this machine are built up into separate units. These spindle units fit into the front compartment of the drive heads proper, and the main driver of the head proper connects with the main drive spindle of the spindle unit. This feature is of advantage, as it permits interchanging spindle units originally furnished with machine with other spindle units having a different number of spindles on different centers. Both heads of the machine are coupled together through a rack and pinions, so that both work simultaneously. The Oilgear functions are such that when the machine is set for drilling the operator engages the control lever, after which both heads rapid traverse forward to a point where the drills are about to start working; then automatically slow down to the proper feeding rate, which can be varied; drill to a predetermined point; and then automatically rapid traverse to the rear or starting position and stop.

With the machine arranged for the tapping operation, the automatic features are much the same, but after the taps have traversed the proper distance and the heads are about to start their return traverse, the reverse rotation of spindles also takes place. If a hole requiring tapping is not drilled to the proper depth or is obstructed in some manner, the sensitiveness of the machine is such that the resistance encountered by the tap would be sufficient to trip the head into reverse feed, and of course, the spindles into reverse rotation.

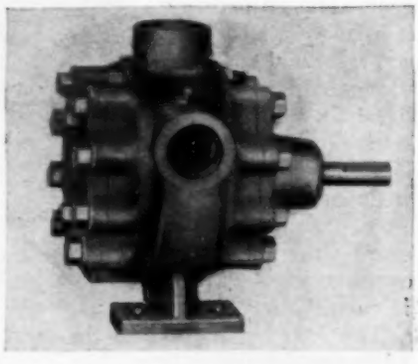
The machine described can be furnished in several sizes, and in many arrangements, such as single-end horizontal, double-end horizontal, three or four-way horizontal, vertical, or combinations of horizontal and vertical. Fixtures may also be furnished.



Rockford Horizontal Multiple-Spindle Drilling and Tapping Machine for drilling nineteen holes on one side of a tractor gear case and seventeen holes on the other and then tapping nineteen holes on one side and seven holes on the other

Roper Series 909 and 911 Pumps for Hydraulic Power Transmission

Two series of geared pumps for use in machine tools, hydraulic feeds, and for accumulator tank service have been developed recently by the George D. Roper Corporation, Rockford, Ill.

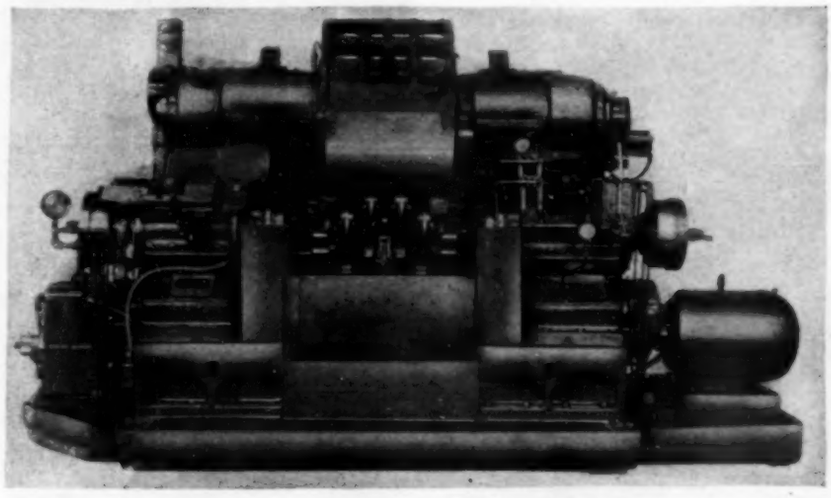


Both series of pumps have ball bearings and herringbone gears, insuring quietness of operation, high mechanical efficiency, and the absence of trapping of oil when teeth mesh. They may be furnished stripped, or mounted for belt, chain, or motor drive.

Each pump is equipped with a leakproof stuffing box and seal ring. Since the gears run continually in a bath of oil, the pump is always primed.

The Series 909 pump is made in four sizes, Nos. 2, 3, 4, and 5, delivering from 5 to 50 gal. per minute at a pressure up to 1,000 lb. per sq.in. The Series 911 pump is made in nine sizes, delivering from 3 to 100 gal. per minute at a pressure up to 300 lb. per sq.in. Both types are suitable for lubricating liquids only. If chain or belt drive is desired an outboard bearing can be supplied. A bed plate is also available for making an integral motor driven unit.

"Crankshaft" Double-Cut, Crankpin-Turning and Cheek-Facing Lathe



Automatic operation is featured in the double-cut cheek-facing and pin-turning lathe announced by the Crankshaft Machine Company, 320 North Jackson St., Jackson, Mich. The machine can also be operated by hand when desired, it being possible to stop the machine at any part of the cycle and return the carriages to the loading position. It is also possible to stop the spindles at any point in the cycle, but they should never be stopped without also stopping the feed. A job or inching button is provided to turn the spindles to any desired position.

Two push-button stations and three levers furnish the controls for the machine. One push button is for the 5-hp. motor for the Oilgear pump. Starting with the machine in the loading position and with the chucks and steadyrest open, the crankshaft is placed in position and the chucks and steadyrest latches are dropped. One air cylinder lever is then thrown to lock the latches. By moving the other air cylinder lever, the driving shoes in the chucks are engaged. The feed lever is then moved to the left and the push button operated. The machine will then automatically face the cheek and pin walls, turn the pins to the desired diameter, return the carriages, and stop the spindles in the loading position. To complete the operation, it is necessary only to trip the two air cylinder levers and open the chuck and steadyrest latches.

The machine is powered with a 25-hp. motor for turning the work spindles and other rotating parts. The crankshafts are held in powerful air-operated chucks connected to a 12-in. air cylinder and the steadyrests are also air operated. Double-end drive is employed, power being applied to both work spindles and to both ends of the master crankshafts.

Each 8-in. worm-driven spindle is carried in two Timken tapered roller bearings having a load capacity of 24,000 lb. and a thrust capacity of 42,000 lb. each at 100 r.p.m. The upper eccentric, or upper master crankshaft, is made in three sections. The two outer sections are each carried in two 4-in. Timken tapered roller bearings and the center section is mounted on three, 3 15/16-in. ball bearings. The lower eccentric, or lower master crankshaft, is made in three sections also, all of which are carried in large ball bearings. By making the above shafts in three sections, it is possible to remove all the special parts required for machining different crankshafts from the machine without disturbing the standard parts or throw the machine out of time.

Two sets of tool arms are provided, and are carried in a housing mounted between the two upper eccentric shaft housings and bolted securely to them. The lower tool arms are driven by the lower eccentric shaft, and they are carried between the two lower worm gear housings, which are mounted on ways in the sides of the columns for supporting the upper carriage assembly.

The tools on the upper arms rough the cheeks, rough turn the pins and pin walls, while those mounted on the lower arms finish turn the cheeks and pin walls of the crankshaft.

The machine weighs 44,000 lb., and is built in the following lengths: for 4-cylinder crankshafts, 150 in.; for 6-cylinder crankshafts, 156 in.; and for 8-cylinder crankshafts, 162-in. It measures 86 in. from front to back and stands 89 in. high. The work spindles are 45 in. from the floor.

Roller Feed and Timing Mechanism for Brown & Sharpe Automatic Screw Machines

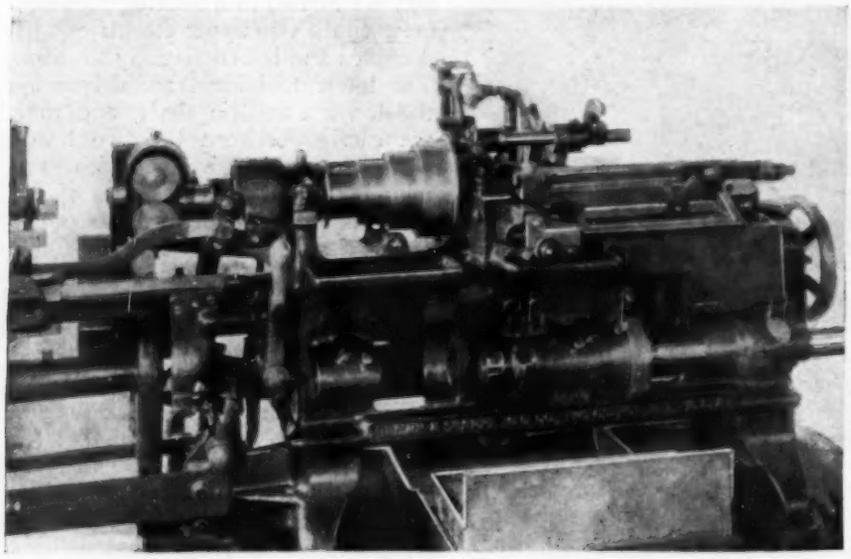
An attachment for B & S automatic screw machines, known as the roller feed and timing mechanism, has been placed on the market by the Brown & Sharpe Manufacturing Company, Providence, R. I. On jobs where pieces are of considerable length, this equipment saves time, since one operation of the roller feed is sufficient to feed the piece the required distance. This eliminates multiple feedings with feeding fingers. The end of each new bar is

positioned to permit trimming to remove waste, leaving only a suitable amount for chucking at the last end.

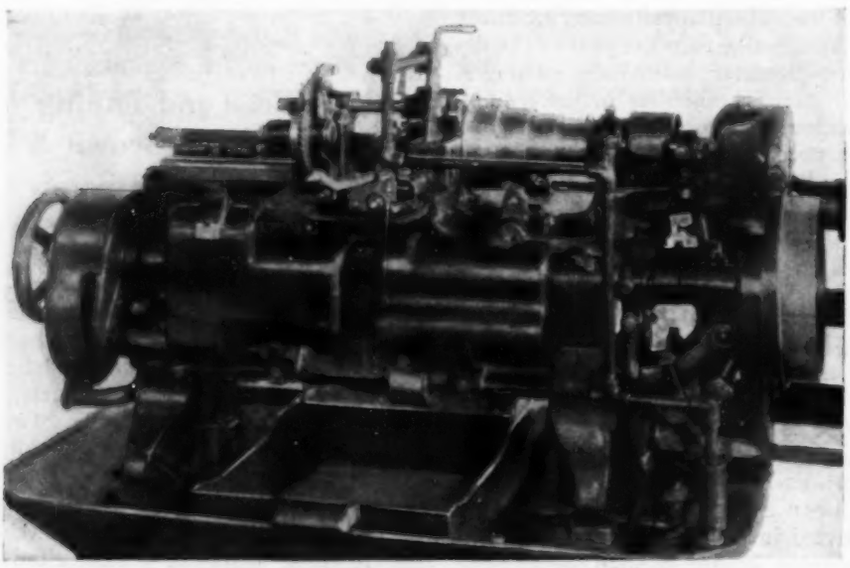
To determine the position for trimming, a swing stop with control mechanism is used. This stop functions only once to each new bar. The operation of the swing stop is controlled by a ratchet wheel operated by a pawl, which is moved by the rear cross-slide each time a piece of work is cut off.

The ratchet wheel has a number of teeth that is a multiple of the number of pieces available in each 10-ft. bar. For example, a ratchet has 44 teeth when 11 pieces are contained in each bar, and four operating dogs are necessary. These dogs are mounted on the side of the ratchet wheel, and when brought to position allow the swing stop mechanism to function. When the trimming operation is completed, the bar is again fed to the stock stop, which determines the correct length of each piece available in the bar.

An automatic cutting-off machine equipped with the roller feed and set up for producing long pieces consumes bars at a very rapid rate. The automatic rod magazine manufactured by the company can be used for restocking the machine automatically.



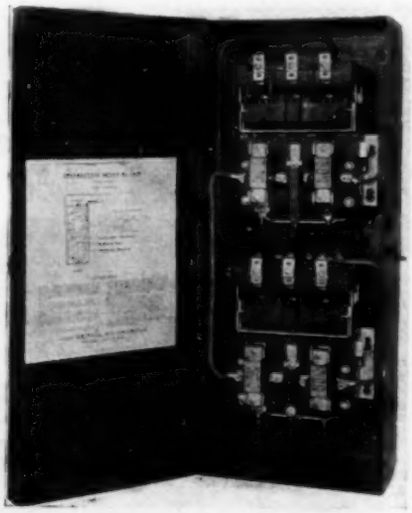
Front view of Brown & Sharpe Automatic Screw Machine, showing the roller feed and timing mechanism



Rear view of Brown & Sharpe Automatic Screw Machine, showing ratchet wheel actuating the swing stop for the trimming mechanism

Condit Type A-30-R Air Motor Starter

A reversing across-the-line air motor starter for the control and protection of squirrel-cage induction motors has been placed on the market

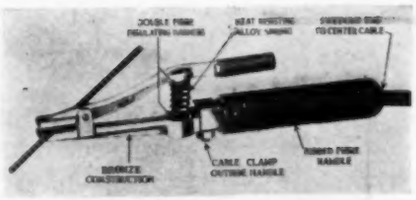


Condit Type A-30-R Air Motor Starter for reversing across-the-line control of squirrel-cage induction motors

by the Condit Electrical Manufacturing Corporation, Boston, Mass. The starter, known as the type A-30-R, consists of two of the type A-30 arc prevention motor starters mounted in an inclosing case and mechanically interlocked. Both starters are equipped with thermal relays for time-lag overload protection. The type A-30-R starter is furnished for push-button control up to 20 hp., 550 and 440 volts; 15 hp. 220 volts, and 7½ hp., 110 volts.

"Meco" Type A Improved Electrode Holder

All size electrodes from $\frac{5}{32}$ to $\frac{5}{16}$ in. can be used on the Type A "Meco" electrode holder manufactured by the Modern Engineering Company, 3411 Pine Blvd., St. Louis, Mo. This device has a so-called "Bulldog" electrode grip, having serrated teeth on both jaws of the holder. These jaws are made of bronze and the handle is of ribbed fiber. A heat-resisting alloy steel spring provides the necessary clamping pressure. The cable passes



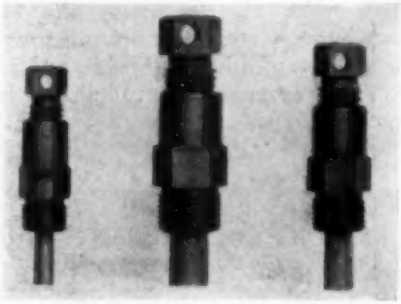
Meco Type A Improved Electrode Holder

through the handle, but is clamped to the holder outside the handle just behind the spring.

Wedge-Lock "Grippit" Two-Action Setscrew

For holding work in place on jigs and fixtures, the Wedge-Lock Tool Company, 2523 North Keeler Ave., Chicago, Ill., has placed on the market a small clamping device known as the "Grippit." This tool replaces the ordinary screw found on jigs and fixtures and securely holds the work, while reducing the chucking time per part. It is made for use on drill jigs, milling fixtures, or assembly fixtures.

Practically instantaneous positive



"Grippit" Clamping Device for jigs and fixtures, giving $\frac{5}{16}$ to $\frac{1}{4}$ in. clearance with a one-eighth turn

locking action is afforded by the "Grippit." More gripping power is afforded than by means of a screw. Unlike a screw, however, the plunger does not rotate, and therefore the work does not move when locked. Neither will the plunger mar the work.

The equipment is composed of four parts: shell, plunger, spring, and operating screw. The shell has standard threads and can be placed in position in the jig or fixture as quickly as a screw. The inside of the shell is hexagonal, to take the hexagon head of the plunger and to prevent the plunger from twisting when operated. One-eighth turn of the screw causes the plunger to advance from $\frac{1}{8}$ to $\frac{5}{16}$ in. When turned in the opposite direction, the plunger retreats from the work the same amount. This provides $\frac{1}{8}$ to $\frac{5}{16}$ in. space for loading or unloading the jig or fixture. With a screw the same clearance would require three or four turns.

"Grippit" clamping devices are available in three sizes, G-12, G-58 and G-34, with plunger diameters of $\frac{1}{2}$, $\frac{3}{8}$ and $\frac{1}{4}$ in., respectively.

"Elkaloy" Electrodes for Spot Welding

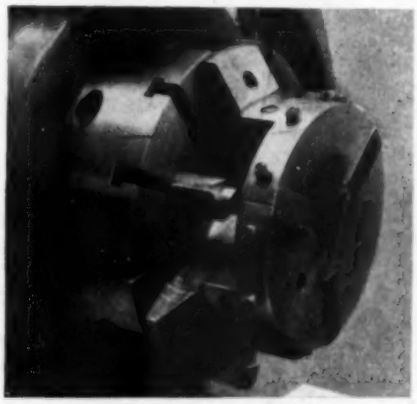
For use on manual spot welders, an electrode material known as "Elkaloy" has been developed by Elkon, Inc., Division of P. R. Mallory & Co., Inc., Indianapolis, Ind. This material is approximately 40 per cent harder than the hardest drawn copper, and lasts from three to five times as long. It requires fewer redressings and makes more uniform welds.

Elkaloy is a special alloy in no way related in its physical characteristics to Elkonite manufactured by the same concern. It successfully welds scaly iron, galvanized iron, cadmium-plated metals, terne plate, and other coated metals.

Gisholt Hydraulically Equalized Chuck Jaws

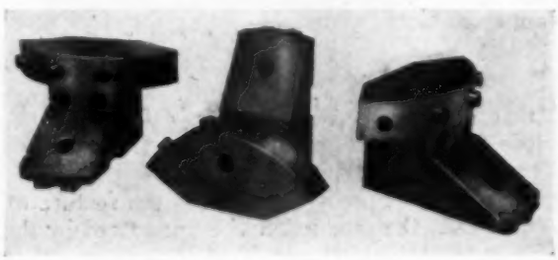
Hydraulically equalized jaws applicable to two-, three- and four-jaw chucks of most any type or make are made to special order by the Gisholt Machine Company, Madison, Wis. They are particularly suitable for parts requiring powerful chucking action such as ring gears, thin-walled parts that can easily be distorted and rough castings or forgings. These chuck jaws present to the work a semi-cushioned surface, or rather, group of surfaces, which eliminates the chucking troubles due to uneven surfaces. Chucking stresses are evenly distributed over the whole chucking surface, thus minimizing distortion of the work.

Each set of jaws contains several



Chuck jaws arranged on a Gisholt Simplimatic Lathe for the internal chucking of a ring gear

pistons free to move in and out through lapped, hardened steel liners. Each of the jaws contains four of these pistons, providing twelve chucking points to grip a ring-gear forging on its inside diameter. These pistons are backed up by a common body of liquid, which transmits pressure from one piston to the others. In chucking a rough piece, one of the pistons will probably come on a high spot. This piston will recede from the jaw, forcing some of the liquid behind it into the cylinders behind the other pistons. When all of the pistons have come into contact with the part being chucked, this cushioned effect ceases, since the liquid is incompressible. The pressure behind each piston is the same, since the areas of the pistons exposed to the liquid pressure are equal, and since the pressure per square inch in all parts of the body of liquid must be the same because it is incompressible.

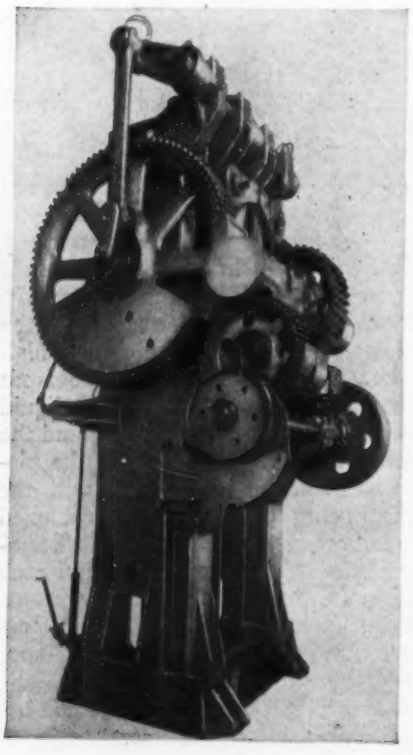


Gisholt Hydraulically Equalized Chuck Jaws, showing that each has four pistons actuated by the hydraulic fluid

Toledo Gigantic Single-Crank Double-Action Toggle Drawing Press

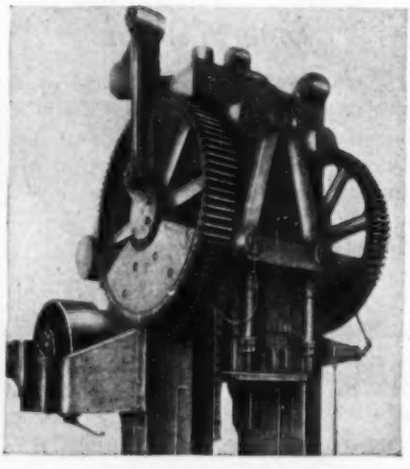
Another mammoth press has been built by the Toledo Machine & Tool Company, Toledo, Ohio. This time, it is a gigantic single-crank, double-action, toggle drawing and deep stamping press weighing 450,000 lb., and requiring a 200-hp. motor. The press embodies a number of special features. The toggle mechanism that operates and controls the dwell of the blank-holder slide is located in the crown, thus permitting the use of twin gearing and giving a compact arrangement with great strength.

All of the toggle operating parts are steel castings, bronze bushed. The press is operated by the Toledo patented multiple-disk friction clutch with independent brake. The clutch mechanism is so arranged that the press mechanism may be operated continuously, or stopped at any part of the stroke. By changing the position of the small stud, the press can be started in the usual manner and it will stop automatically at the top center.



Drawing a stainless steel shell 24 in. in diameter by 24 in. deep by ⅛ in. thick can be done on this press

The following specifications illustrate the enormous size of this press. The stroke of the plunger slide is 45 in., with an adjustment of 10 in. by a power elevator, using a 10 hp. reversible motor running at 1,200 r.p.m. Distance between the uprights is 69 in., and the plunger is 50 in. front to back by 42 in. right to left;

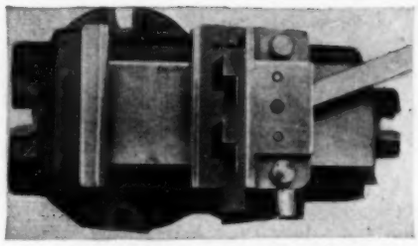


the blank-holder is 68 in. front to back by 57 in. right to left, and the top of the bed is 68 in. square. The die space, or the distance from the top of the bed to the bottom of the plunger slide, with the stroke down and adjustment up, is 80 in. The thickness of the bolster plate is 8 in.

The 72-in. flywheel has a 24-in. face and weighs 11,000 lb. Twin gears on the main shaft are 125 in. in diameter by 16-in. face. Triple gearing gives a ratio of 80:1 and permits 3⅞ strokes per minute. The crankshaft is sufficiently large to permit drawing stainless steel shells 24 in. in diameter by 24 in. deep by ⅛ in. thick. Extreme over-all height is 422 in.

"Wedge-Lock" Production Vise

Speedy operation is the feature of the production vise announced by the Wedge-Lock Tool Company, 2523 North Keeler Avenue, Chicago, Ill. Loading and unloading time is reduced to a minimum, since the locking lever requires only a 15-deg. pull to engage the work, and then 7 deg. more to lock it securely.



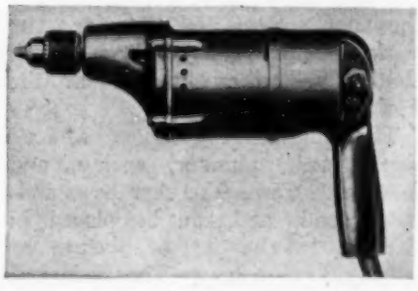
Showing the three wedges used to lock the "Wedge-Lock" Production Vise by means of a total handle movement of 22 deg.

The production vise can be adjusted to various size parts by loosening two screws. Maximum opening of the vise is equal to the width of the jaws. Locking surfaces are flat and parallel so that wear is eliminated. At present the vise is manufactured in four sizes having 4-, 5-, 6- and 7-in. jaws, the depths being $1\frac{3}{16}$, $1\frac{5}{8}$, $2\frac{1}{4}$ and $2\frac{5}{8}$ in., respectively.

As shown in the illustration, the simple locking contact of the Wedge-Lock vise assures the jaws being parallel under all conditions, thereby distributing evenly the holding pressure. The vise is flat on top and has no slots for chips to accumulate. It is provided with lugs.

"Little Giant" Nos. 18 and 19 Universal Electric Drills

Capacity for drilling to $\frac{3}{16}$ in. is found in the "Little Giant" Nos. 18 and 19 electric drills announced by the Chicago Pneumatic Tool Company, 6 East 44th St., New York, N. Y. These drills are designed for use in aeroplane and automobile body



"Little Giant" No. 19 Universal Electric Drill

trim departments and in metal furniture work.

The No. 18 drill has quick-acting simple switch construction having a trigger lock in the "on" position. It can be changed to a normally open type by removing the locking pin. Free speed of the 18A model is 4,300 r.p.m. and of the 18C model, 2,800 r.p.m. Loaded speeds are 2,520 and 1,650 r.p.m. respectively.

The No. 19 universal drill weighs about 4¾ lb. and is 9¾ in. in overall length. It has a pistol-grip handle and a toggle switch in the rear. Free and loaded speeds for the A and C models are the same as for the No. 18 drill.

American Type V-50 Full-Automatic Broaching Machine

Broaching bushings from seamless steel tubing is an example of the work that can be done on the full-automatic broaching machines, Type V-50, announced by the American Broach & Machine Company, Ann Arbor, Mich. This bushing has a hole approximately $1\frac{5}{16}$ in. in diameter, the bushing being approximately 5½ in. long. Approximately 0.080 in. is removed from the bore with one pass.

The pieces are fed to the machine from the cutting-off machine on a previous operation to a tube mounted on the front of the machine. The parts dropping into this tube fill the magazine, below which is an automatic slide controlled by a hydraulic cylinder. This cylinder is timed by a valve on the left-hand side of the machine. When the slide is in its outer position receiving the work, the broach shank is in its lower position. The slide then moves inward, carrying the work into position. The broach immediately rises by means of a hydraulic cylinder in the base, and connects into an automatic pull head, which starts immediately on its upward or cutting stroke and continues until the work loading slide leaves the work and moves backward for another piece.

Fig. 1 shows the work slide drawn forward ready to receive another piece of work, and while in this position the broach is going upward and is broaching the previous piece of work.

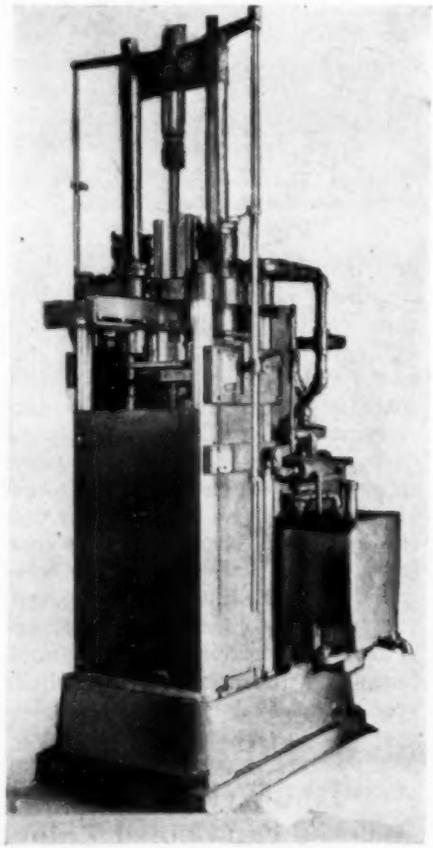


Fig. 1—Work slide of American Type V-50 Full Automatic Broaching Machine drawn forward ready to receive a piece of work while the broach is working on the previous piece

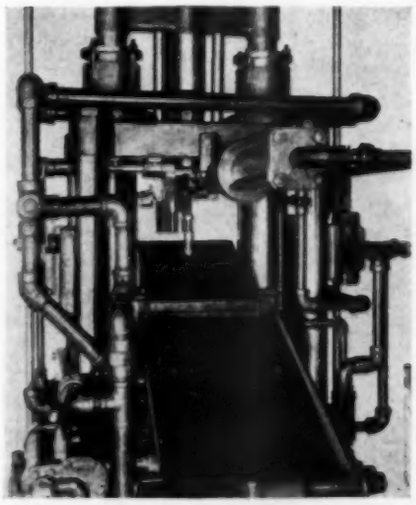


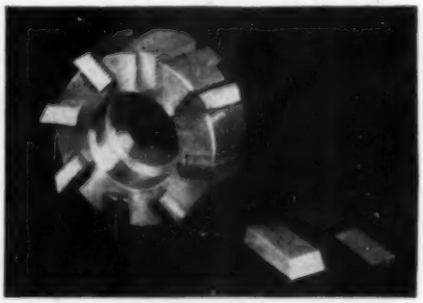
Fig. 2—Broached work falls down the chute

After the broach has passed completely through the work, the work comes out and slides down a chute, as shown in Fig. 2. The ram immediately returns to the starting position, and releases the broach into a receptacle, after which the cycle is repeated. The cycle requires 12 seconds.

No lever is required for the operation of the machine. It is started and stopped by means of an electric switch controlling the motor. Some of the advantages of this machine are: no operator is required, and vertical broaching tends to center the work better than other methods. The machine can be placed next to drilling machines or cutting off machines without occupying a large amount of floor space.

National-Cleveland Inserted, Serrated-Blade Cutters

Inserted, serrated-blade cutters, comprising shell-end mills, face milling cutters, alternate tooth cutters, straddle mills, and other cutters of special design have been placed on the



market by the National Tool Company, Cleveland, Ohio. Among the advantages of these cutters are: Blades are locked in position more securely; more blade adjustment, resulting in longer life; quicker adjustment or replacement of blades; and lower cost of maintenance. Bodies are made from heat-treated alloy steel; blades are made of high-speed steel, hardened and ground. Cutters with Stellite or tungsten-carbide blades can be furnished. Serrations on the backs of the blades are $\frac{1}{10}$-in. pitch with 90-deg. included angle.

Shell end mills can be furnished in

six sizes, ranging from 3 to 6 in. in diameter with general dimensions corresponding to the American Standard. Face milling cutters can be furnished from 6 to 20 in. in diameter, to fit National Standard spindle noses or previous standards of such machines as Cincinnati or Milwaukee. These cutters are regularly furnished with $\frac{3}{8}$-in. blades. Heavy-duty cutters with $\frac{1}{2}$-in. blades can be furnished to order.

Alternate-tooth cutters can be regularly furnished from 4 to 8 in. in diameter. Cutters of larger diameter are made to order. Straddle milling cutters can be made from 4 to 8 in. in diameter. Stellite or tungsten-carbide blades can also be had.

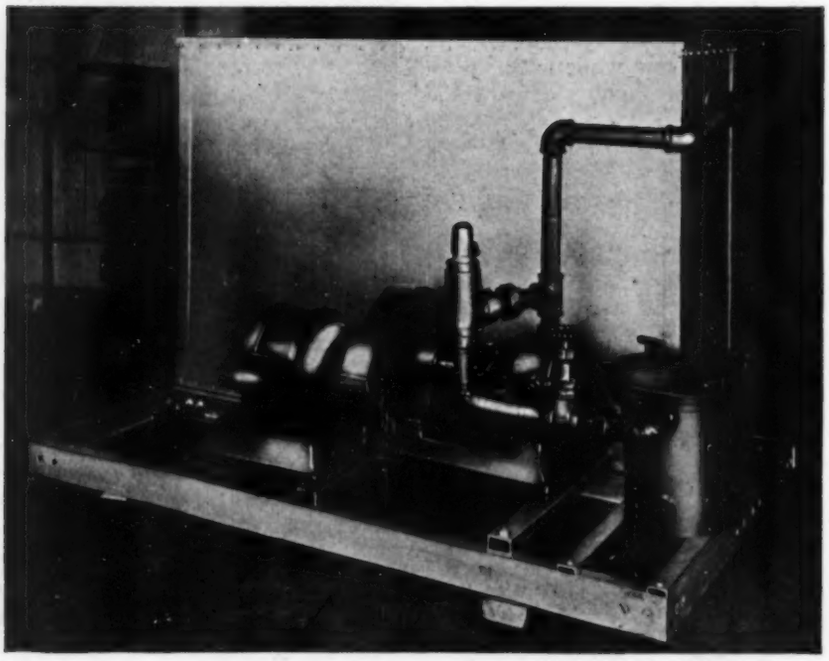
Despatch Finish Conditioning System

Dirty, off-color, and streaked finishes are eliminated by the finish conditioning system developed by the Despatch Oven Company, 622 Ninth Street, S. E., Minneapolis, Minn. This system not only cleans the finish at all times, but keeps the pigments and oils in proper condition by constant agitation. It is designed particularly for use with dipping and flow methods of applying finishes.

The system is a combination of strainer and agitator designed compactly into a single portable unit. The finishing material is taken from the dip tank or flow coating device by a specially designed rotary pump driven by an electric motor. This pump forces the finish through the strainer and then back into the dip tank or flow coating device. The cycle is continuous and the equipment is usually arranged so that all of the finish in the tank is passed through the strainer once every five to ten minutes. This assures clean finishes at all times and maintains a uniform viscosity.

The unit is provided with an indicator, which tells the operator when cleaning of the strainer is necessary. There is no necessity for shutting off the system for cleaning as the by-pass valve takes care of the finish during this period. When pressure in the system exceeds a predetermined limit, the by-pass valve opens and the finish circulates around the pump until the screen is cleaned.

This equipment is arranged for any size or shape of tank and for all finishes. For example, it may be aranged on a truck together with a dip tank, or it may be mounted on a truck alone and used to clean and to agitate finishes in two or three tanks alternately, although the apparatus must be cleaned each time.

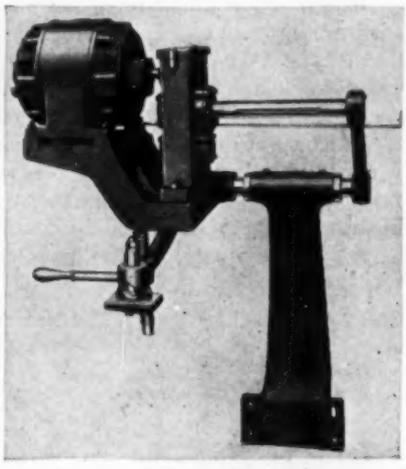


Single unit Despatch Finish Conditioning System attached to a small dip tank

Cullman Lathe Drive

Modernization of cone-pulley lathes can be effected with the lathe drive manufactured by the Cullman Wheel Company, 1344 Altgeld St., Chicago, Ill. It is quickly and easily attached, only four bolt holes being needed. No other alteration is required. It is made in 1-, 2-, 3-, and 5-hp. sizes for lathes with from 14- to 36-in. swings.

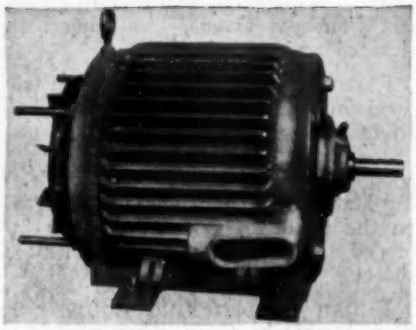
The drive consists of a bracket mounted on the rear of the lathe by four bolts. On the foundation shaft are mounted: two collars for side adjustments; the main bracket turning with the shaft carrying the Cullman speed reducer with shaft extension for the cone pulley; the arm carrying the raising and lowering device for easy belt shifting; the collar to keep the raising and lowering arm in place; and the arm that carries the ball bearings for the cone pulley shaft. Lathes so equipped require less space and can be arranged for better light and other conveniences. The combined speed reducer-cone pulley drive permits many spindle speeds.



Four bolts are required to mount the Cullman Lathe Drive

"Linc-Weld" Totally Inclosed Fan-Cooled Motors

Arc-welded steel construction is employed in the line of "Linc-Weld," totally inclosed, fan-cooled motors announced by the Lincoln Electric Company, Cleveland, Ohio. These



Cover removed from "Linc-Weld" Totally Enclosed, Fan-Cooled Motor to show the corrugated radiating surface made of corrosion-resisting metal

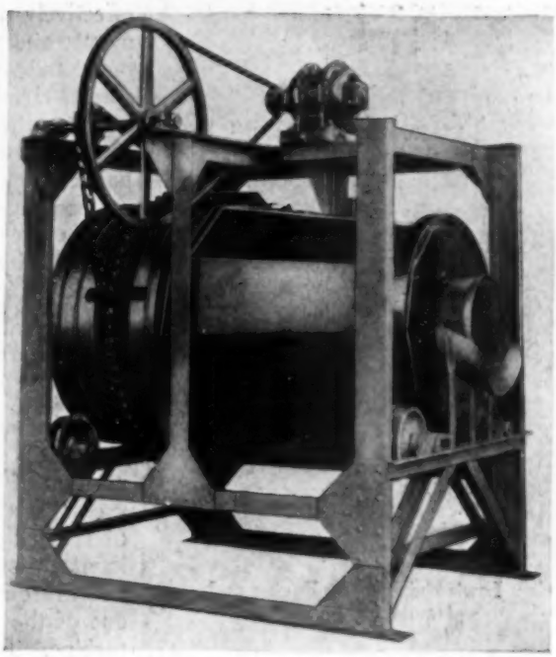
motors also employ double-sealed ball bearings and a removable cover that facilitates easy cleaning of the large radiating surface. The temperature rise is considerably less than the allowable rise for motors of this type.

The illustration shows the motor with the steel cover removed to expose the corrugated radiating surface. This conducts the heat created within the motor to its outer radiating surface, which is constantly cooled by a continual draft of fresh air from a fan on the motor shaft. Air imprisoned within the corrugated frame is constantly circulated by a fan arc-welded to the rotor. The corrugated cooling surface is easily accessible as shown for cleaning.

These "Linc-Weld" motors have the same mounting dimensions as standard, open-type, horizontal motors of equal rating. Sizes manufactured are from 1 to 50 hp.

Ideal Ball Burnishing Barrels

Quantity production of burnished parts can be done with the "Ideal" ball burnishing barrels announced by N. Ransohoff, Inc., Cincinnati, Ohio. The work is charged into the barrel and run in one direction until a perfect burnish is obtained. After the burnishing is complete, the operator reverses the barrel to discharge the work. Work and balls are separated automatically, the work passing out at the end, the balls passing through the cylindrical screen to be retained in a metal cone. Fine screen patches on the cone carry off soap solution. Rotating the barrel again in the running direction automatically returns the balls to the burnishing chamber, ready for the next batch of work. Since the balls often weigh twice as much as the work itself, the labor saved in handling them is important.

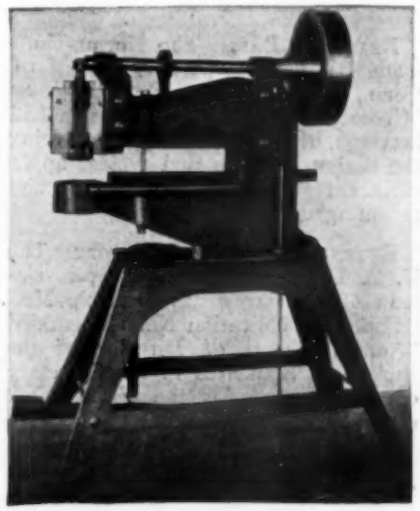


Ideal Ball Burnishing Barrel, which automatically returns the balls to the burnishing chamber after being separated from the work

The barrel is 10-sided, and the sides and charging end are of 3-in. maple. The diaphragm between the burnishing section and the cone is of bronze. The screen is likewise of bronze. The barrel has a diameter greater than its length, a design which increases its burnishing efficiency. It runs on chilled rollers which rotate in Hyatt roller bearings. V-belt drive is provided for the motor.

Clough No. 4 Punch Press

Holes from $\frac{1}{8}$ to 4 in. in diameter can be punched in No. 16 gage with the No. 4 punch press announced by R. M. Clough, Meriden, Conn. The machine is fitted with an adjustable slide, having a 1-in. adjustment, and fitted with a 1-in. hole to receive shanks of the larger size punches.



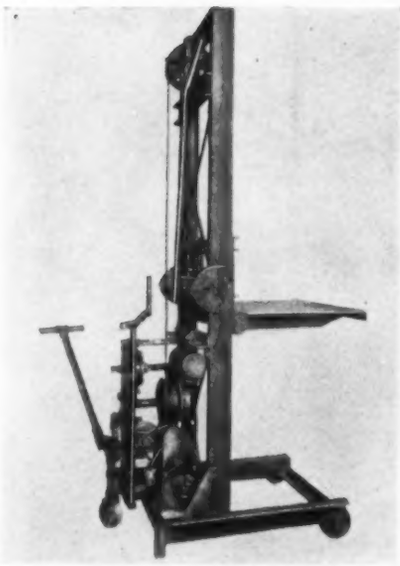
Small punches take a sleeve, using a $\frac{3}{8}\frac{3}{2}$-in. diameter shank on the punches. Dies are made rectangular for punching $2\frac{1}{2}$ to 4 in. in diameter. For sizes from $2\frac{3}{16}$ to $\frac{1}{8}$ in., round dies, using a cast-iron holder, are held securely to the machine in the same manner as rectangular dies, by two hex machine screws.

The shaft is machined from high-grade crucible steel, power being transmitted from the slide by means of a special cam having adjustable connection with right- and left-hand check nuts. The clutch is so designed that it will engage the bolt in the flywheel at each one-half revolution. Disengagement of the clutch is effected by means of a treadle. Two throat sizes are manufactured, 18 and 24 inches.

Lewis-Shepard Gas-Engine-Driven Stacker

A combination gas-engine-driven and hand-power stacker has been added to the line manufactured by the Lewis-Shepard Company, Watertown Station, Boston, Mass. This machine is operated by a compact $2\frac{1}{2}$- to 3-hp., air-cooled, four-cycle engine, and will lift a 1,000-lb. load at 40 ft. per minute. Lowering is taken care of by means of a decelerator control.

The stacker is of value for tiering



Lewis-Shepard Gas-Engine and Hand-Driven Stacker

and storing material so that floor space is saved and handling eliminated. The gasoline motor removes restrictions imposed by power lines.

Kipp Air Chipper

Close control of the tool is the primary feature of the Kipp air chipper announced by the Madison-Kipp Corporation, Madison, Wis. This tool operates at air pressures of 60 to 100 lb. per sq.in. and delivers over 6,000 blows per min. Thus, an even flow of power is obtained when the chisel is pressed to the work. The intensity of the blow is regulated by the pressure the operator exerts against the work and also by the position of the trigger valve. The operator, therefore, has close control of the chisel, so that he may work to a line and stop at a line.

The Kipp air chipper may be used effectively on tool and die work, metal and wood pattern making, metal and wood production work, and special riveting, chipping, and grooving operations.

Over 6,000 blows per min. are struck by the Kipp Air Chipper

As shown, the air chipper not only has a pistol grip, but also has a body or housing of pistol shape. Kipp chisels are inserted into the barrel and held by a spring clamp. Chisel shanks are pentagon in shape and may be inserted with any of the five sides upward. A variety of chisels is available, and blank chisels may be provided.

Air admitted to the rotary valve is controlled by a trigger valve. The position of this rotary valve is always such that the air flows to either end of the hammer cylinder. Thus, the hammer is driven forward or backward through a half cycle to uncover one of the ports connected to the air turbine. The air revolves the turbine attached to the rotary valve, the rotary valve directing the air from one side of the hammer to the other automatically. The reciprocating action imparts pulsating energy to a floating striker shaft located at the forward end of the hammer cylinder. This striker shaft in turn drives the chisel when pressure is applied to the work. On the reverse stroke of the hammer, an air cushion is provided to absorb the vibration and shock.

The weight of the Kipp air chipper is 1½ lb. and the length is 5⅝ in.

TRADE PUBLICATIONS

BEARINGS, BALL. The Norma-Hoffmann Bearings Corporation, Stamford, Conn., is distributing a catalog on "Greaseal" felt-protected precision ball bearings of the closed type, covering the design features and typical applications, together with load ratings and mounting dimensions.

BUREAU OF STANDARDS REPORT. The U. S. Department of Commerce, Bureau of Standards, has available Miscellaneous Publication No. 115 entitled "Annual Report of Director of the Bureau of Standards to the Secretary of Commerce," for the Fiscal Year ended June 30, 1930.

CONVEYOR OVENS. The Despatch Oven Co., 622 Ninth St., S. E., Minneapolis, Minn., has issued bulletin No. 12 on "Despatch Special and Intermittent Conveyor Ovens," featuring both elevated and tunnel types.

FERROUS CASTINGS. The Electric Steel Founders' Research Group, 541 Diversey Parkway, Chicago, has issued "Specifications for Ferrous Castings adopted by American Society for Testing Materials, 1930." These are printed on the inside of a manila folder intended for subsequent specification sheets.

FINISH CONDITIONING EQUIPMENT. The Despatch Oven Company, 622 Ninth St., S. E., Minneapolis, Minn., now has available bulletin No. 96 on its finish conditioning equipment, describing the operation, advantages, and control.

GEARS. The Charles Bond Co., 617 Arch St., Philadelphia, Pa., now has available Catalog No. 56 on standard stock gears, chains, ball bearings, pulleys, flexible couplings, and casters.

GRINDERS, ROLL. The Landis Tool Co., Waynesboro, Pa., has issued Catalog H-301 on Landis 36-, 48- and 60-in. type 30 roll grinders, completely describing and illustrating the various features, and giving the specifications.

LADLES. The Johnson Tool Co., 65-67 Massasoit Ave., East Providence, R. I., has published a pamphlet entitled "Casting Hammers with the 'Field' Mould and Ladle." Various non-ferrous hammers and handles are also illustrated.

SHEARS AND BAR-CUTTERS. The Buffalo Forge Co., Buffalo, N. Y., has published bulletin No. 330 on billet shears, bar-cutters and special bar-cutters with electrically welded frames, showing the many types in which these machines are available and giving the capacities.

SPEED REDUCERS. The Foote Bros. Gear & Machine Co., 111 N. Canal St., Chicago, Ill., now has available Catalog No. 102 on "IXL Titan Helical and Herringbone Speed Reducers." This booklet gives complete information on construction, specifications, and ratings.

THREADING MACHINES, PIPE. The Landis Machine Co., Waynesboro, Pa., has issued bulletin No. D-65 on the 1¼- and 2-in. pipe and nipple threading machines manufactured.

TRACK SCALES. The U. S. Department of Commerce, Bureau of Standards, has issued circular No. 386 entitled "Specifications for the Manufacture and Installation of Railway Track Scales for Light Industrial Service."

WELDING ACCESSORIES. The Fusion Welding Corporation, 103rd St. & Torrence Ave., Chicago, Ill., has published a catalog known as "Fuzon Accessories," covering cable, electrode holders, goggles, handshields, and various related items.

NEWS OF THE WEEK

A.S.M.E. Annual Meeting Being Held This Week

SEVERAL additions to the program of the Annual Meeting of the A.S.M.E. being held this week have been announced recently. Col. Arthur Woods, Chairman of the President's Emergency Committee on Employment, addressed the Society on Monday afternoon, Dec. 1 on various aspects of the present situation and the corrective measures being undertaken. Dr. W. A. Shewhart, Chairman, called a meeting of Subcommittee No. 6 of the Sectional Committee on Graphical Presentation for Thursday, Dec. 4. The development of a rational outline of the principles underlying the construction of engineering and scientific graphs is the general subject of the open meeting and discussion. Included in the program is a brief outline of the present status of the work of Subcommittee No. 6, followed by several papers, including, "Appearance Factors in Engineering Graphs," "Attention Value of Good Chart Design," "Angle of View and its Bearing on Layout, Proportions, Weights of Lines, and Lettering of Lantern Slides," and a general discussion.

New officers of the Society were also inducted in the process of the meeting. These include Roy V. Wright, who has become president; William A. Hanley, director of the engineering division of Eli Lilly & Co., Indianapolis; Thomas R. Weymouth, vice-president of the Columbia Engineering & Management Corporation, New York, and Dr. Harvey N. Davis, president of Stevens Institute of Technology, who have become vice-presidents, and William L. Batt, president of the S. K. F. Industries, Inc.; Herbert L. Whittemore of the U. S. Bureau of Standards, and Harold L. Doolittle of the Southern California Edison Company, who were made managers.

A general resumé of the sessions and of the papers presented will be included in the Dec. 18 issue of *American Machinist*, following a news story in the issue of Dec. 11.

Gray Iron Foundry Indexes Hold Up

According to the October report of the Gray Iron Institute, Inc., production of 161 Gray Iron foundries for October was 65 6 per cent of normal, as compared with 65.7 for September, and 123.1 for October, 1929. New business in October for 81 foundries was 47.4 per cent of normal, as compared with 49 for September and 109.4 for October, 1929. Unfilled orders index for 75 foundries was 25.9 per cent, as compared with 37.3 in September, and 72.6 for October, 1929. Material received for 122 foundries was 63.2 per cent of normal, as compared with 65.3 for September, and 129.4 for October, 1929. Material on hand for 129 foundries was 135.5 per cent, as compared with 118.2 in September, and 148.5 in October, 1929. District No. 3, comprising Wisconsin, Illinois, and the area west of the Mississippi River and south to the Mexico-U. S. border, showed the greatest activity of the three major districts. The Chicago district also shows an increase over September. Class "C" foundries, or those with normal production of 251 to 400 tons per month, showed the greatest activity. In these reports, "normal" means average monthly production during the last three calendar years.

Machinery and Tool Exports Show Expected October Decline

WASHINGTON, D. C., Dec. 2—Exports of machinery (including vehicles) during October were valued at $47,347,298. This is almost $5,000,000 less than the value of exports of machinery in September, and is $38,000,000 less than comparable exports in October of 1929. Electrical apparatus and machinery, textile machinery, and sewing machines were the only sub-divisions of the machinery figures which showed an increase in October over the September figures. The figures for each sub-division, as gathered by the Department of Commerce, follow:

	October, 1930	October, 1929	September, 1930
Electrical machinery and apparatus	$9,332,681	$13,442,620	$8,717,767
Industrial machinery	14,045,801	23,271,146	15,944,465
Construction and conveying machinery	1,450,985	1,941,827	1,580,773
Mining, well and pumping machinery	2,236,958	5,187,658	3,406,082
Power driven, metal-working machinery	1,821,391	2,714,921	2,239,515
Other metal-working machinery	450,405	619,827	574,222
Textile machinery	760,664	1,108,793	649,231
Sewing machines	508,883	960,963	432,002
Shoe machinery	123,146	108,647	152,373
Other industrial machinery	5,500,322	8,198,673	5,653,809

Detailed Figures for Power-Driven Metal-Working Machinery

	Quantity	October, 1930	Quantity	October, 1929
Engine lathes	37	$37,612	100	$227,454
Turret lathes	32	115,433	28	101,257
Other lathes	21	47,212	82	181,306
Vertical boring mills and chucking machines	17	64,512	6	22,505
Thread cutting and automatic screw machines	39	46,970	102	145,605
Knee and column type milling machines	20	52,152	58	122,461
Other milling machines	31	124,233	41	107,725
Gear cutting machines	4	18,562	31	88,693
Vertical drilling machines	18	17,120	26	26,381
Radial drilling machines	3	7,783	8	26,567
Other drilling machines	76	23,757	228	41,584
Planers and shapers	4	10,037	22	46,489
Surface grinding machines	3	1,515	24	32,653
External cylindrical grinding machines	20	74,874	53	112,984
Internal grinding machines	20	73,040	53	82,978
Tool grinding, cutter grinding and universal grinding machines	82	29,829	64	38,634
Other metal grinding machines	..	70,718	..	116,046
Sheet and plate metal-working machines	..	319,482	..	189,680
Forging machinery	..	57,965	..	120,763
Rolling mill machinery	..	85,329	..	193,831
Foundry and molding equipment	..	238,680	..	128,773
Other power-driven metal-working machinery and parts	..	304,576	..	550,552

Detailed Figures for Other Metal-Working Machinery

		October, 1930		October, 1929
Pneumatic portable tools	..	89,648	..	184,779
Other portable and hand- or foot-operated metal-working machines and parts	..	83,438	..	110,039
Chucks for machine tools	..	8,609	..	27,278
Drills and reamers	..	79,072	..	58,695
Pipe stocks, pipe dies and pipe cutters	..	31,284	..	70,877
Other thread-cutting die stocks, screw plates, taps and dies	..	63,544	..	62,371
Other metal-working machine tools	..	94,710	..	105,785

A.S.A. Standards and Federal Specifications

Drafts of the proposed American standard for pipe flanges and fittings have been prepared by the A.S.A. technical committee on this subject under the sponsorship of the A.S.M.E., the Heating and Piping Contractors National Ass'n, and the Manufacturers' Standardization Society of the Valve & Fittings Industry. These drafts cover pipe plugs of cast iron, malleable iron, cast steel, and forged steel; steel base-fittings for maximum steam working pressures of 250, 400, 600 and 900 lb. per sq. in.; and steel companion flanges.

The proposed American Standard for dimensions of Woodruff Keys has been submitted to the A.S.A. for approval. The standard was prepared by an A.S.A. technical committee under the sponsorship of the A.S.M.E. A general review of the proposal indicates that the committee has made no attempt to simplify or co-ordinate existing sizes regularly produced by any given manufacturer, but instead has attacked the problem from the standpoint of the user, proposing a series of 27 keys of various thicknesses. The radius of curvature of these keys ranges from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch a series said to cover approximately 90 per cent of the requirements of the consuming industry. The committee found that the limits of the key, the keyslot, and the keyslot cutter must be very carefully controlled to produce the desired results. They also found that for certain shafting or arbor materials, the number of teeth in the keyslot cutter affected the rate of cutting and also, to some extent, the quality of fit of the key in the slot. Upon reviewing the results of these tests, the committee decided to include in the standard both the fine and coarse tooth series for each of the cutter diameters. Instead of using an unrelated series of numbers and letters, or combinations of the two, for designation of the standard Woodruff Key series, a system has been developed in which one series of digits represents the nominal width of the key slot or cutter rising by $\frac{1}{8}$-in. increments, and a second series of digits represents the nominal diameter of the keyslot or cutter with $\frac{1}{4}$-in. increments. A combination of digits from both series in the order above makes the number assigned to each key. A limited number of copies of these drafts are available for loan through the A.S.A. Information Service, 29 W. 39th St., New York City.

The Federal Specifications Board has recently distributed Federal specifications for steam hose couplings, a resubmission of the proposed revision for Federal Specification 339A on Metals, and a specification on Seamless Brass Tubing 427A. The board will receive any comments or suggestions as to changes which may be thought desirable in the specifications. Such comments or criticisms must be received by the board not later than Jan. 1, 1931.

The revised Simplified Practice Recommendation No. 95 on Skid Platforms has received the required degree of acceptance, and may be considered as in effect, according to a recent announcement by the Division of Simplified Practice of the Bureau of Standards.

Under the authority granted to the Commissioner of Patents by Congress, more than 750,000 files in connection with abandoned patent applications which have been on file more than 20 years will be destroyed or returned to the applicants by the Patent Office within the next six or eight months.

Leipzig Trade Fair To Be Held in March

Comprising 10,000 exhibits assembled from 22 countries, the Leipzig Trade Fair will be held this year from March 1-7. Exhibits of similar merchandise are displayed in the same or closely grouped buildings of the 67 available and an attendance of some 200,000 buyers is claimed, including 30,000 from foreign countries. The United States will send more than 100 exhibits and upwards of 2,000 buyers from all parts of the country.

Canadian Agricultural Machinery Report

The making of agricultural implements is carried on in Canada by some 65 firms, and represents a capital investment of $104,172,440, according to the latest report of the Dominion Bureau of Statistics which covers the year ending Dec. 31, 1929. The same source of information reports that this industry gave employment last year to over 12,000 persons; that the cost (at works) of the materials used was $21,172,694, and that the selling value of products at the works was $47,307,000.

Just what proportion of this output was for export may be gaged by the fact that in the same year the total exports of farm implements and machinery from Canada amounted to $19,835,000, or approximately 42 per cent of the total Canadian production. Imports of these implements, on the other hand, amounted to no less than $31,845,000 for the same period or approximately 68 per cent of the total output in Canada.

THE Industrial Development Department of the Cleveland (Ohio) Chamber of Commerce, with offices at 1704 Terminal Tower, has established a new service to which inventors may submit descriptions of their devices. These are then listed in a letter which is sent to more than 2,000 manufacturers. The service is primarily for inventors who have applied for patents.

Property Protection Is Prize Subject

The Charles C. Linthicum Foundation has announced as its prize monograph competition for 1931 the subject, "The International Protection of Industrial Property." A bronze medal and $1,000 as first prize, and five sums of $100 each as second prize with honorable mention, will be awarded to the authors of the best manuscripts, submitted by Dec. 15, on the above subject. Copies of the Draft Convention may be obtained from the Chairman of the Linthicum Foundation Committee, Northwestern University School of Law, 357 East Chicago Ave., Chicago.

Cincinnati A.S.M.E. Discusses Aeronautics

The Cincinnati Section of the A.S.M.E. met on Nov. 20 at the Engineers' Club, with aeronautics as the principal subject of discussion. Glen Angle, Vice-President and Chief Engineer of the R. K. LeBlond Aircraft Engine Co., contrasted present-day construction and operation of aircraft engines with those of a decade ago. The improvement in materials used in the manufacture of engines has greatly lengthened the number of flying hours per overhaul. Whereas it was formerly necessary to recondition engines after 100 hours of flying, it is now unnecessary to overhaul them until after 200 to 300 hours of running. Mr. Angle expresses his opinion that the most important contribution to aircraft engine manufacture must necessarily come through improvement in materials. John Paul Riddle of the Embry-Riddle Co., Cincinnati, outlined the development of air transportation within the next few years, and Major Bradley Jones of the University of Cincinnati explained the phenomenon of air currents in the lift of airplanes. The Baron Shiba film illustrating the effect of air currents on wings was shown.

Roy V. Wright
Who becomes president of the A.S.M.E.

British Machine Tool Import Decline is Less Than Export Falling Off

By Our London Correspondent

BRITAIN'S outstanding problem, unemployment, remains unsolved despite efforts to relieve the situation, and figures continue to increase. The two million limit has been passed for some time. The result is that the unemployment insurance fund is in debt to the extent of about £60,000,000. Through a committee, all three political parties have been endeavoring to reform the unemployment insurance scheme, but without result. A royal commission will, therefore, sit and, it is to be hoped, will not, as usual, form an instrument of delay.

Although rather less has been heard lately of rationalization, the process continues. In the metal trades little has been announced recently in this direction, but a merger of the three chief ball bearing producers in this country is being discussed.

As is sufficiently well-known, the overseas trading of the United Kingdom during the current year has, compared with the corresponding period of 1929, shown a decline both in exports and imports to an almost equal extent in the two classes. 1930 totals are £120,000,000 in imports, more than £102,000,000 in exports, and £16,750,000 in re-exports. But in value exported machinery has declined considerably more than imported machinery, imports being down by less than £500,000, while exports declined by more than £4,000,000. Some decline is shown also in electrical goods and apparatus exported, while imports, on the other hand, increased in value.

Machine tool exports have not maintained the high figures of last year, though they are well in advance of 1928, figures for 1930 so far being £1,412,334. Imports at £1,308,186 also show a fall, particularly during recent months, though the decrease is not nearly so marked as in exports. Taking into account the re-exports, apparently so far this year exports have exceeded retained imports of machine tools in value by £144,424.

The decline in machine tool exports is very largely due to the falling away in the demand from the British Dominions. The exports to South Africa, Australia, and British India are down. These three areas together are taking less than half the value of the machine tool exports to the countries of Europe where, during recent years, a marked improvement has been shown in prospects for British machine tools. Europe this year has taken something like one-half the total value of exports in this class.

Generally, the position of the British machine tool industry shows little change, though the rate of output has certainly diminished. Some of the makers of heavy tools are very slack. At the approach to the end of the year the railway companies do not form a ready market. The electrical industry has been buying fairly well, but demands in the motor industry have not so far been equal to those of previous years. Prices have been "cut to the bone."

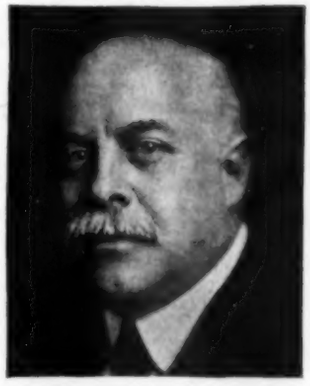
The automobile industry is beginning to accelerate production, but at present orders received and in prospect are largely for smaller cars, and in anticipation of this demand some amount of night work has been thought necessary. Sales of medium- and higher-priced cars have not been so promising. The trades auxiliary to the motor industry are feeling the benefit of the more hopeful view, at any rate as regards the lighter cars, though not all are optimistic. There is the possibility that the system of taxation as applied to automobiles in this country may be changed. The influence of the present tax on engine design is held to form a handicap when the export trade is under consideration, and some of the chief firms would prefer taxation on the ton-mile basis. The commercial vehicle side of the industry has been passing through the slack period of the year but is in quite a satisfactory position. A steady sale of airplanes for export has been reported, recent orders, including one from Greece, to the value of £200,000.

Running rapidly through some of the other branches of engineering, the electrical section is well placed, with the home market almost secured by a sentimental protection, while British firms have also been successful in tendering for transforming and other equipment for export where competition is severe. Their opponents, the gas engineers, are also busy, largely, it is stated, as the result of municipal orders. But makers of gas and oil engines are still in an unsatisfactory position. Orders for locomotives, whether for home or export, are insufficient in number. Boilermakers and also colliery engineers are quiet, and in view of the condition of the textile industry it is not surprising to find that manufacturers of textile machines are short of orders. If credit terms can be arranged Russia may be again in the market.

Waste-Elimination Understanding Means Lessened Business Troubles

Paul Wooton
Washington Correspondent

BETTER understanding of waste-elimination principles should contribute substantially toward alleviating business difficulties, Secretary of Commerce Robert P. Lamont suggested in addressing a large number of representatives of industry assembled in the Commerce Department to discuss the progress of simplified practices in industry. At the present time, it was brought out, approximately 120 branches of industry have adopted simplification with savings which they estimate total more than $250,000,000. Explaining that this type of co-operation with business was one of the projects instigated by Mr. Hoover as Secretary of Commerce, Mr. Lamont urged that an intensive effort be made to acquaint the consumer with the benefits of simplified practices.



DR. GEORGE K. BURGESS

Dr. George K. Burgess, Director of the Bureau of Standards, outlined the work of the planning committee for simplified practice which was set up by President Hoover when Secretary of Commerce. He declared that the movement receives the support of the Federal Specifications Board. Dr. Burgess also alluded to the work of the Bureau's division of trade standards which, he explained, carries out the simplification movement into the field of quality standards.

Captain D. W. Wainwright, Jr., Acting Chief Coordinator, Bureau of the Budget, showed how the government benefits from simplified practice. The Federal government as a whole is a large consumer, spending approximately $1,000,000 a day for purchases and is therefore deeply concerned in the movement.

BUSINESS ITEMS

The Chrome Alloys Manufacturing Co. has leased 2,400 sq.ft. of floor space at Dennison & King Sts., Oakland, Calif., for a complete foundry business. This firm's products include a complete line of marine hardware, valves, cannery machinery, metal novelties of various descriptions, made from "Krom-Aloy," a new chrome alloy. The sales manager is J. C. Rodger and the shop manager H. McFadgen.

The Wierton (W. Va.) Steel Co. will place its new structural mill in production on Dec. 15.

Joseph T. Ryerson & Son, Inc., Continental Illinois Bank Bldg., Chicago, Ill., recently acquired the stock and good will of the sheet metal division of the Richards Co. Inc., Boston, Mass. The Richards Co., founded in 1812, will continue in business, specializing in pig metals. Sheet stocks will henceforth be carried in the regular Ryerson warehouses at Third, Binney, & Munroe Sts., Cambridge, Mass.

The Michigan Steel Corporation, Ecorse, Mich., is to be purchased by the National Steel Corporation, a $132,000,000 holding company, providing the stockholders approve. The National Steel Corporation of Detroit was organized in 1929 through a merger of the Great Lakes Steel Corporation, the Weirton (W. Va.) Steel Co., and certain properties of the M. A. Hanna Co.

The Watson Flagg Machine Co., Paterson, N. J., has been incorporated with $250,000 and 5,000 shares of common stock to operate a general machine shop.

Stockholders in the American Multigraph Co. have approved the consolidation with the Addressograph International Co. A new company will be formed under the name of the Addressograph Multigraph Corporation, as announced in *American Machinist* on Nov. 20.

The Victor Manufacturing & Gasket Co., Chicago, has recently ordered 7,500,000 lb. of rolled sheet copper for current and immediate future needs.

William A. Hanley
Who becomes an A.S.M.E. vice-president

The American Tractor Equipment Co., Oakland, Calif., has opened an eastern branch in Peoria, Ill., as forerunner of the removal of the entire plant to that city after the first of the year, according to N. G. Livingston, newly appointed eastern manager. Warehousing facilities have been secured at 1321 South Washington St., Peoria.

PERSONALS

Lieut. Colonel George S. Brady, Managing Editor of *Product Engineering* and Associate Editor of *American Machinist*; Lieut. Colonel Frederick K. Knowlton, President of the Auburn Ball Bearing Co.; Lieut. Colonel Robert R. Abbott, Consulting Metallurgical Engineer of the White Motor Co.; Lieut. Colonel Willard F. Rockwell, President of the Equitable Meter Co., the Michigan Valve & Foundry Co., and H. A. Smith Machine Co.; Major Donald M. Liddell, Consulting Engineer; and Major Walter C. Sanders, General Manager of the Railway Division, Timken Roller Bearing Co.; were among the class of twenty-three picked reserve officers taking a two-weeks' course of advance training in procurement planning at the office at the Assistant Secretary of War, Washington, from Nov. 9 to 22.

Wallace Clark of Wallace Clark & Co., 2152 Graybar Bldg., New York, N. Y., returned from Europe on Dec. 2, to remain in New York until Jan. 15.

Colonel Dickson of the Watertown, Mass., Arsenal will speak on two subjects before the Bridgeport Section, A.S.M.E., on Dec. 9. The meeting will be held in the Auditorium of the General Electric plant at Bridgeport, and the subjects will be, "The Atomic-Hydrogen Welding Process," and, "X-ray Examination of Metallurgical Structures." M. W. Brewster of G. E. will present talking moving pictures.

T. S. Fuller, Metallurgist of the General Electric Co., Schenectady, N. Y., will speak on "Metallurgical Problems of the Electrical Manufacturing Industry," at the Jan. 12 meeting of the New York Chapter, A.S.S.T. The Dec. 8 meeting will be a visit to the Union Carbide & Carbon Research Laboratories.

Lorenz Iversen, considered by associates one of the best steel works engineers in the country, has been elected president of the Mesta Machine Co., West Homestead, Pa., to succeed the late Harry F. Wahr. Mr. Iversen learned the machinist trade in Denmark, then went to sea for two years. He began working in the United States as a machinist for Gould & Eberhardt. After a university course at the University of Bingen, Germany, he returned to the United States in 1902 and went to work in Mesta's designing room.

Harvey N. Davis
Who becomes an A.S.M.E. vice-president

W. S. Johnston, associated for the past four years with Allied Engineers, Inc., New York, recently took a position with the Stone & Webster Engineering Corporation, Boston, Mass., as engineer in the mechanical division.

W. R. Judson, Manager of the Santiago, Chile, district office of the Allis-Chalmers Manufacturing Co., Milwaukee, with charge of its South American operations for the past 13 years, has recently been appointed managing director of Allis-Chalmers (France), a subsidiary of this company in Paris for its activities in Europe and Northern Africa.

L. W. Mesta has been elected vice-president of the Mesta Machine Co., West Hempstead, Pa. He was formerly assistant general superintendent and has been with the company since 1911. F. A. Mesta has been elected director to fill the vacancy on the board caused by the death of Harry F. Wahr, former president.

Jno. F. Nulty has been appointed eastern railway sales representative of the Centrifix Corporation, 3029 Prospect Ave., Cleveland, with headquarters in Philadelphia. Prior to coming with Centrifix, Mr. Nulty was associated with the Baldwin Locomotive Works for many years, in charge of the Accounting and Estimating Departments.

J. L. Osgood, President of the J. L. Osgood Tool Co., Buffalo, left recently on a foreign sales and pleasure trip, to be gone until March 15. His trip will cover Cuba, Panama, San Francisco, Honolulu, Chile, Argentine, Brazil, and Bermuda.

Bernard B. Patten, formerly sales representative in New York and New England for the V & O Press Co., Union Turnpike, Hudson, N. Y., has been appointed western district sales manager, with offices at 543 W. Washington Blvd., Chicago, Ill.

T. I. Phillips, formerly superintendent of metal stamping at the AB Building, Nuttall Works of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., has been appointed works manager to succeed H. A. Houston, resigned. W. H. Himes, formerly in the Mechanical Engineering Department at East Pittsburgh, has been pro-

moted to manager of the engineering department to succeed L. F. Burnham, resigned. L. R. Botsai has been appointed gearing apparatus manager, to succeed E. E. Boon, resigned. Mr. Botsai was formerly industrial manager of the Central District.

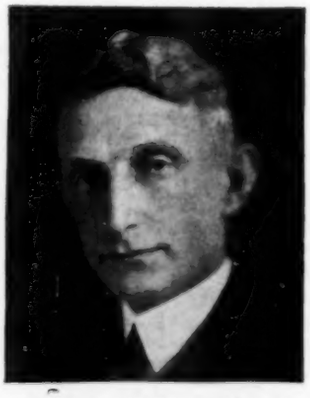
E. J. Prindle, patent attorney of New York City, will speak on "Patents" at the Dec. 2 meeting of the Providence local section of the A.S.M.E.

Frederick B. Rentschler, Chairman of the Board, United Aircraft & Transport Co., New York, N. Y., has been elected chairman of the board of the Sikorsky Aviation Corporation, Bridgeport, Conn., to succeed A. C. Dickinson, who resigned because of poor health. W. A. Bary, Vice-President, General Manager, and Director of the Sikorsky company has resigned and has been succeeded by George S. Wheat, Vice-President of United Aircraft.

Captain Scott B. Ritchie of the Watertown (Mass.) Arsenal will speak on, "Recent Developments in Gun Construction," at the Dec. 10 meeting of the Schenectady local section, A.S.M.E. Captain Ritchie will describe the centrifugal casting of alloy steel guns, and methods of cold-working thick cylinders.

Millard Romaine of the Cincinnati Milling Machine Co., will speak on, "Milling Machine Applications" before the Cleveland Section of the A.S.M.E. on Dec. 11 in the Cleveland Engineering Society Rooms. Hans Ernst of the same company will speak on, "Hydraulics in Machine Tools."

Lawrence H. Underwood, General Superintendent of the Indiana Harbor, (Ind.), plant of the Youngstown (Ohio) Sheet & Tube Co., has been promoted to Middle West district manager.



Thomas R. Weymouth
Who becomes an A.S.M.E. vice-president

H. L. Terwilliger, Secretary of Ingersoll-Rand Co. of California, and vice-president of the San Francisco Machinery Dealers' Association, is spending some time in the Hawaiian Islands in the interests of his firm.

S. Wells Utley of the Detroit Steel Castings Co., was recently elected president of the National Founders' Association, at their convention in New York City, to succeed T. S. Hammond, President of the Whiting Corporation, Harvey, Ill. Carl H. Hoostetter of the Odin Stove Manufacturing Co. was elected vice-president of the association.

J. K. Webb has been appointed Texas representative for the Allen-Bradley Co., 1311 South First St., Milwaukee, Wis. His office will be 601 Allen Bldg., Dallas.

OBITUARIES

W. R. Balsinger, 61, Assistant to the President of the Carnegie Steel Co., Pittsburgh, Pa., which he served in various capacities for more than 50 years, died on Nov. 26 at his home in Pittsburgh. He began work with the company in 1879 as a hammer boy.

Edward H. Kenyon, 70, for many years a steel expert with the Carnegie Steel Co., New York, and who resigned when the U. S. Steel Corporation was formed, died on Nov. 18 at Miami Beach, Fla. He retired about 30 years ago.

Joseph E. Knox, head of Joseph E. Knox Co., Lynn, Mass., died on Nov. 19. He was born in Scotland in 1859 and came here about 50 years ago.

John Love, 76, President of Love Bros., Inc., Aurora, Ill., died on Nov. 20 at his home after a 3-month illness.

Charles H. Markham, 69, chairman of the board of the Illinois Central Railroad, died at his suburban home in Altadena, Calif., on Nov. 24. He had been ill for some time.

Robert J. Gross, 80, former vice-president of the American Locomotive Co., and first president of the U. S. Radiator Corporation died on Nov. 21 at his home in Dunkirk, N. Y. He had been failing for several months.

Henry T. Pratt, 76, who was connected with the American Steel & Wire Co. for about 32 years and was district sales manager at Cleveland for many years died in St. Petersburg, Fla., on Nov. 11.

Walter J. Towne, 63, Chief Engineer of the Chicago & Northwestern Railroad, died on Nov. 24 at his home in Oak Park, Ill.

Conrad W. Troll, 72, President of the Belmont Stamping & Enameling Co., New Philadelphia, Ohio, died recently at his home in Cleveland Heights, Ohio. He was also president of a number of other companies and a director in several Cleveland banks.

James R. Vance, 81, former president of the Geneva (N. Y.) Boiler Works, and inventor of the Vance and Columbia boilers, died on Nov. 16 at his home in that city. He retired from business several years ago.

E. S. Wheeler, 41, Chicago District Sales Representative for the V & O Press Co., Hudson, N. Y., died suddenly in Chicago on Nov. 20, following an operation. He held an executive position at the V & O factory before taking charge of the Chicago office.

Myron E. Zeller, 26, chief pilot for the Aircraft Division, Ford Motor Co., and Carl Wenzel, 30, chief test mechanic, were killed in a crash of a Ford experimental tri-motored plane at Detroit on Nov. 24.

FORTHCOMING MEETINGS

American Standards Association—Annual meeting, Dec. 11, Engineering Societies Bldg., New York City. P. G. Agnew, 29 West 39th St., New York, secretary.

American Management Ass'n—Shop Methods Conference at William Penn Hotel, Pittsburgh, Pa., from Dec. 11-12. Headquarters, 20 Vesey St., New York, N. Y.

Society of Automotive Engineers—Annual meeting, Detroit, Jan. 19-23, 1931. John A. C. Warner, 29 West 39th St., New York, secretary.

Fifth Midwestern Power & Engineering Conference and Exposition—Chicago, Feb. 10-14, 1931. G. E. Pfisterer, 53 West Jackson Blvd., Chicago, secretary.

Western Metal Congress and Exposition—Second National, Civic Auditorium, San Francisco, Calif., Feb. 16-20, 1931. Under auspices of A.S.S.T. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

Three-M-Congress — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18, 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., New York City.

American Society of Mechanical Engineers—Calvin W. Rice, executive secretary, Engineering Societies Bldg., 29 West 39th St., New York, N. Y. The following meetings are scheduled:

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.

National Materials Handling Meeting and Management congress, Cleveland, Ohio, Apr., 1931.

National Aeronautic Meeting, Baltimore, Md., May, 1931.

American Foundrymen's Association—Annual convention and exhibition, Stevens Hotel, Chicago, May 4-8, 1931, C. E. Hoyt, 222 West Adams St., Chicago, secretary.

American Gear Manufacturers' Association—Annual Spring Meeting, Hotel Statler, Buffalo, May 7-9, 1931. T. W. Owen, 3608 Euclid Ave., Cleveland, secretary.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

NEW YORK

Present conditions might well be described by any of the reviews of the last month. There has been no change of moment in the situation; none is expected until after the beginning of the New Year. In a few cases, orders and inquiries have increased over last week, but the majority of dealers report no change. A $20,000 order from a Pennsylvania engine company is understood to have been taken by a New York dealer. Other orders include a few from adjacent municipal governments for single small tools. Rumors are rife of price cutting on the part of less scrupulous dealers who find the unpaid telephone bills mounting up, but the great majority of dealers can be depended upon to refrain from anything approximating this practice.

As one dealer puts it, "The low time is at least a lot nearer its end than it was a year ago Thansgiving!" The New York Central is inquiring for 50 locomotives to cost about $5,000,000, and is considering the placing of orders for 5,000 freight cars.

CINCINNATI

In spite of strenuous merchandising efforts, machine-tool manufacturers of the Cincinnati district failed to make any gain in sales in the past month. In the past week, the Thanksgiving holiday caused a proportionate reduction in bookings. Selling agents find but a small demand in this territory and about all they are accomplishing is to develop prospects for later buying.

The week's business was featureless, consisting in the main of orders from miscellaneous users whose requirements were single items. A fair volume of inquiries were received.

BUFFALO

Tool business in western New York seems to be marking time. Reports indicate that it is no worse than it has been. Neither is it much better.

However, there have been some individual sales. One dealer reported the sale of five lathes, a small Universal tool grinder, a bolt cutter, and some smaller items during the last half of November. Not more than one piece of equipment went to any one purchaser. Another reported the sale of a radial drill.

There seem to be more "active" inquiries than formerly, but it is unlikely that many of them will result in orders before the New Year. Most of the orders thus far have been from small businesses. Demand in the electrical field continues light. This is also true of contractors' equipment. Some inquiries are out on pumps and other equipment for public improvements.

MILWAUKEE

Although the two months following the August low showed a gradual improvement generally, November failed to continue the progress made thus far and showed a slight loss over the previous month. Inquiries are plentiful, but so few of them have been turned into actual orders that the trade is beginning to lose faith in them.

In the mean time the trade is finding a limited demand for single replacement tools, orders coming from a variety of industries and aggregating just about enough to keep the plants working on a satisfactory basis.

PHILADELPHIA

Tool business continued in a state of lethargy during the last two weeks, with a few scattered inquiries, but little indication of an impending resumption of business.

Optimism expressed by manufacturers and sales agents a few months ago has given way to expressions of hope and nothing more. Most dealers in this market are operating on whatever schedules limited business will permit and hoping for the future to bring something.

■

THANKSGIVING DAY was just another holiday in machinery and machine tool markets, many dealers and builders feeling that the turkeys were not the only birds who got it in the neck. On the other hand, November sales totals were by and large equal to those of October; furthermore, the character of inquiries being received is an encouraging factor. Orders being secured now are the result of strenuous merchandising efforts or sudden needs for replacement. Few buyers can be induced to part with orders, and some are even postponing the delivery of purchased machines until after the New Year. Some of the reasons are budgetary, but many are just the annual feeling that nothing must be done until New Years.

NEW YORK conditions are unchanged from last week; a few dealers report better sales, the others no change. A $20,000 sale to a Pennsylvania engine company was placed. Buffalo lists some individual sales, and characterizes newer inquiries as "active." Both inquiries and orders are for single items from small purchasers. The same statement holds true for Cincinnati. Milwaukee, on the other hand, reports a slight loss for November, with inquiries of the type that the trade loses faith in, though plants there are still working on a "satisfactory" basis. Philadelphia is lethargic.

CLEVELAND dealers expect little for the next sixty days. Though inquiries there are holding up, sales skidded in November. New England likewise expects a lower November sales total, though other lines of industry are improving. Detroit reports a further increase in activity, considered temporary by many, though the trade is optimistic and figures the bottom of the decline has been passed. Chicago totals stayed steady or improved slightly in November. Indianapolis sales are to electric utilities and radio builders.

CLEVELAND

With one or two rare exceptions, sales of machinery and machine tools are down to zero. The nearness of the holiday season, combined with economic policies, is having its accustomed effect on industry. There is very little buying and it is confined to single items for emergency purposes. Inquiries are holding up well, but the trade is of the opinion that very little buying will be done in the next sixty days.

November business skidded downward, and with a few concerns it was the poorest month of the year. December holds very little promise. Peerless Motor Car Corporation has resumed full-time production.

NEW ENGLAND

New England maintains a low level of tool distribution while registering another listless week. All indications point to a lower November sales total. January optimism is the new dish, but it savors freely of the wish bone variety. Uncertainty is the outstanding characteristic of the situation.

Despite the poor showing in machine tool distribution, improvement is apparent in other lines. Paper machinery and textile machinery orders spell pick up in those industries. Machinery inquiry from several sources is noted, but closing even on definitely known requirements is hard to engineer. Used tool dealers report no improvement. All houses are prepared for the inventory business likely to develop and are showing a fine assortment of reconditioned tools.

DETROIT

Some slight increase in activity has been noted in the last ten days, but dealers do not attach any great significance to the development. The volume has not increased except in a few lines, and even in these it may be due to temporary conditions.

Most dealers here are convinced that the resumption of activity in the automobile plants will bring about a gradually increasing demand for equipment of various kinds before the winter has passed. In general the situation is much as it was throughout the fall, with the exception of the increasing optimism that has been generated, apparently by the improvement in the automobile industry and the slight general increase in employment. Dealers seem to believe the bottom of the depression has been reached and passed.

CHICAGO

With inventory taking almost at hand, and shop equipment necessities to be carefully considered afterward, the situation is not expected to develop any features for the remainder of the year. Business is at a stage that makes any forecast of the next two or three months merely conjectural, one guess being as good as another. November sales are reported by a few selling agents and distributors as showing a slight improvement, but in the majority of cases the level is said to be about the same. A representative of one of the large machine tool manufacturing plants located in an adjoining state informed the writer that from present estimates his company's business for 1930 would show a falling off of about 25 per cent. This he regarded as not so discouraging in view of the present situation. So far as can be ascertained there are no lists of any importance to be expected before the beginning of 1931.

INDIANAPOLIS

Little change is seen here. There is some scattered buying, but the entire trend of sales follows that of the past six months. Some seasonal buyers, chiefly, are virtually out of the market. Chief of these are the contractors. Some sales are being made to the coal industry, but for the most part the sales of big machinery have been made. Such buying as is being done now is for small machine shop equipment.

The big buyers in the machinery field seem to be the electric utilities. The last six months has seen quite a trend toward municipal plants. Demand from the iron and steel business is sporadic. Some plants seem to have business and are buying replacement equipment, but for the most part the demand is not normal. There are some fair sales being made to the furniture industry, but again the volume is not normal. The radio industry has been an active buyer of equipment during the entire fall.

BUSINESS • BAROMETER

Details of American trade and industry are now beginning to look more encouraging

THEODORE H. PRICE
Editor, Commerce and Finance, New York

THANKSGIVING week is generally a period of commercial quietude, and this year was not an exception to the rule. At the higher altitudes recently attained in the stock market traders were content to halt awhile, and in the commodity trade no changes of significance occurred.

It is surprising that anyone should feel nervous about the sale of the cotton and wheat that is owned or controlled by the United States government. Congress is meeting, and we may be sure that it will find some way to prevent the Federal Farm Board from liquidating its holdings precipitately unless cost or more can be obtained. Leaders in the House and Senate are meantime preparing for a thoroughgoing inquiry into the action taken by the Farm Board and its subsidiaries. It is reported that in return for the renewed buying of wheat the farm leaders will forego their demand for the adoption of an export debenture plan before the present Congress adjourns. But even if this is true the issue is only deferred, not settled. No one can foretell or forecast the ultimate result, but it probably means a prolonged debate, and it may eventually result in the passage of a bill that the President will have to veto unless he agrees with Emerson that "consistency is a weakness of the narrow-minded."

This is a brief statement of the politico-economic conditions which prevail in this country. They are dealt with at length as the relationship between American politics and American business is growing closer day by day, and it is almost impossible to discuss the one without giving attention to the other.

Twenty-four months ago the highly placed officials in Washington were acclaiming and proclaiming an eternity of prosperity. We were in a new era into which adversity would not be allowed to enter. But the new era came to an end, and perpetual adversity is now predicted by those who have lost money.

The unequal distribution of gold is one of the reasons given for this adversity. It is true that France and the United States between them own about 60 per cent of the world's supply of monetary gold, which now amounts to about $10,000,000,000. This proportion may be more than these two nations ought to have, but it is used entirely as a reserve. Little or no gold is in circulation, and those nations whose supply is smaller than it used to be will save the interest formerly paid on holdings that were excessive. The gold question is, in fact, becoming a theoretical one. Everyone prefers paper, and it will continue to be preferred as long as the national credit of a stable government is behind it.

As compared with 1929, the details of American trade and industry are now beginning to look a little more encouraging than they did. The efforts to sell made by the department stores and most distributors of goods are commencing to have their effect. The volume of the merchandise sold during the week, as measured in pounds or yards, is said to be running very close to last year, and inventories on Dec. 31 are expected to be very light.

Some improvement in the automobile factories is reported, although the gain in production is mostly to supply dealers against next year's demands. Large orders for copper at 10½ cents are unfilled and production is being curtailed in accordance with the agreement. The steel industry is not active, but it sees more reason for cheer as it looks ahead, and in our larger cities there is much new building under way.

The business of providing jobs for the jobless goes on apace. There are many unemployed in New York, but those who are experienced in such matters say that a great many of those who are idle have come here from smaller cities or rural districts in which work was to be had by those who really wanted it. The exact facts cannot be ascertained, but the machinery of social amelioration is being put to work.

Of the ultimate future of American business there can be no doubt. A distinct revival will probably make itself felt just as soon as merchants realize how small their stocks are, but it may take a little time to get at the facts. The present disposition is to procrastinate in buying. This tendency will probably continue until Congress' attitude can be gaged. If it shall be reassuring, a distinct revival after New Year's may be expected.

This revival would have come sooner if merchants had not seized upon the bank failures in the Nashville district as a reason for further procrastination. It must be admitted that these failures have seriously disturbed confidence in the region affected, and that it will take time to mend the trouble and mistrust that they have caused. If they had not occurred the business revival that everyone now expects would probably have marked the beginning of a reconstructive movement that would have embraced the whole country. As it is the return of prosperity may be delayed a few weeks, but its arrival is not for that reason in any doubt.

THE BUSINESS WEEK

December 3, 1930

THERE are enough statistical giblets in this week's records to make a more appetizing sauce for the otherwise dry and lean Thanksgiving turkey this year. . . . Business shows more definite signs of having hit that hard-pan resistance level which in the past it has always encountered at about 20% below normal. . . . At this point apparently the elasticity of living standards in this country reaches its limit and fundamental human wants begin to reassert themselves. . . . At any rate our preliminary index, after dipping below 80, has turned up sharply to 81% of normal. . . . Though basic industrial activity is still declining, general trade has begun to expand at somewhat more than the seasonal rate. . . . Consumer demand for homes is sustaining construction activity at a time when it is normally declining, and there are signs that small residential building is definitely on the up-grade. . . . Money turnover is rising, commercial loans are expanding, currency in circulation is increasing with seasonal retail trade demand. . . . As the automobile industry prepares to play its card courageously on next year's market, employment is being given some stimulus. . . Key commodity prices are firmer as resistance to further deflation grows and as the Farm Board lends its support to stabilize the domestic market. . . . The bond market is steadier as bank buying improves, and bears in Wall Street and elsewhere are beginning to look about for winter quarters.

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THE WEEKLY PRICE GUIDE . . . S

Rise and Fall of the Market

INCREASED activity in January, despite slight hopes of any improvement this month, is the attitude of dealers in steel products everywhere. Demand from railroads, construction and the automotive industry consists largely of inquiries, so far as steel is concerned. Higher asking prices are noted in most of the non-ferrous metal products. Paint stuffs also are firmer. Slab zinc, on the other hand, dropped 0.2c., to 4.1c., at E. St. Louis, this week. Minimum on furnace coke at Connellsville is down 10c., to $2.50, per net ton, a move consistent with present slowness in iron buying. Nickel contacts are being made at present price levels for 1931 delivery. In 1929, when most non-ferrous metals went up, nickel prices remained unchanged.

(*All prices as of Nov.* 29, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$16.69@$18.19
Northern Basic	19.89@ 20.39
Southern Ohio No. 2	19.89@ 20.39
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	18.00@ 18.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.00
Virginia No. 2	18.75@ 19.25
Basic	22.29
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	19.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	18.20
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.63@ 20.13
Basic	19.63@ 20.13
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4 75@5.00
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90@2.00	3.35†	3.00	3.40†
No. 12	1.95@2.05	3.45†	3.10	3.45†
No. 14	2.05@2.15	3.55†	3.20	3.50†
No. 16	2.15@2.25	3.65†	3.30	3.60†
Black				
Nos. 18 to 20	2.15@2.25	3.60†	3.40	3.70
No. 22	2.30@2.40	3.75†	3.55	3.85
No. 24	2.35@2.45	3.80†	3.60	3.90
No. 26	2.45@2.55	3.90†	3.70	4.00
No. 28	2.60@2.70	4.05†	3.85	4.15
Galvanized				
No. 10	2.20@2.30	3.65†	3.50	3.55
Nos. 12 to 14	2.30@2.40	3.75†	3.60	3.65
No. 16	2.40@2.50	3.85†	3.70	3.75
No. 18	2.55@2.65	4.00†	3.85	3.90
No. 20	2.70@2.80	4.15†	4.00	4.05
No. 22	2.75@2.85	4.20†	4.05	4.10
No. 24	2.90@3.00	4.35†	4.20	4.25
No. 26	3.15@3.25	4.60†	4.35	4.50
No. 28	3.40@3.50	4.85†	4.70	4.75

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt..	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.75†	4.00	3.75†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.85†	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin,, flat or square‡	3.90	4.15	3.85
Structural shapes	3.10†	3.00	3.00†
Soft steel bars	3.10†	3.00	3.00†
Soft steel bar shapes	3.10†	3.00	3.00†
Soft steel bands	3.40†	3.65	3.20†
Tank plates	3.10†	3.00	3.00†
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 5/16-in. thick by ¾-in. wide. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—5/32, 8.35c. per lb.; ⅛, 7.85c. per lb.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			12.75
Tin, Straits, pigs, New York			27.75@28.75
Lead, pigs, E. St. Louis	4.95	New York	6.00@ 7.00
Zinc, slabs, E. St. Louis	4.10	New York	5.75@ 6.75

	New York	Cleveland	Chicago
Antimony, slabs	9.50@10.50	10.50	10.75
Copper sheets*	21.75	21.75	21.75
Copper wire*	13.25	13.37½	13.37½
Copper, drawn, round*	20.25	20.25	20.25
Copper tubing*	24.12½	24.12½	24.12½
Brass sheets, high*	18.62½	18.62½	18.62½
Brass tubing, high*	23.50	23.50	23.50
Brass rods, high*	16.87½	16.87½	16.87½
Brass wire, high*	19.12½	19.12½	19.12½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†	24.00@25.00	24.30	23.30
Zinc sheets (casks)	9.75@10.25	11.25	10.36
Solder (½ and ½)	22.50	21.50	20@22

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	48.00
Commercial genuine, intermediate grade	35.00
Anti-friction metal, general service	30.00
No. 4 babbitt, f.o.b.	10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished	52.00	42.00
Sheets, cold rolled	60.00	50.00
Strip, cold rolled	55.00	45.00
Rods, hot rolled	45.00	35.00
Rods, cold drawn	50.00	40.00
Tubing	75.00*	90.00†
Angles, hot rolled	50.00	40.00
Plates	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper	8.25 @8.50	8.50	7.25@ 7.75
Copper, heavy, and wire	7.50 @7.75	8.00	6.75@ 7.25
Copper, light, and bottoms	6.75 @7.00	7.25	6.00@ 6.50
Heavy lead	4.00	4.00	3.00@ 3.50
Tea lead	2.00	2.50	2.00@ 2.50
Brass, heavy, yellow	4.50 @4.75	6.50	4.00@ 4.50
Brass, heavy, red	7.00 @7.25	9.50	6.25@ 6.75
Brass, light	3.50 @3.75	5.50	3.50@ 4.00
No. 1 rod-brass turnings	4.75 @5.00	5.50	4.00@ 4.50
Zinc	2.00	1.50	1.25@ 1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13	$0.16	$0.15
Cotton waste, colored, per lb.	.09½	.12	.10
Wiping cloths, washed, white, per lb.	.14	38.00 per M	.14½
Sal soda, per lb.	.01¾	.02	.02
Roll sulphur, per lb	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.	.102	.104	.10
Cutting oil, about 25% lard, in 5 gal. cans, per gal.	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	60%	50–10%	50%
Second grade	60–5%	60– 5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.031	$0.031	$0.0325
Cold fin. shafting	per lb.	.034	.034	.035
Brass rods	per lb.	.16873	.14873	.2125
Solder (½ and ½)	per lb.	.225	.2275	.2975
Cotton waste, white	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.	per 100	4.59	4.59	4.59
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.33	.33	.33
Belting, leather, medium	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs	off list	65%*	65%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*	$6.03	$6.03	$6.03
Emery cloth*	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†	2.61	2.61	2.61
Cloth†	4.59	4.59	4.59
Fire clay, per 100 lb. bag	.90	.75	75
Coke, prompt furnace, per net ton	Connellsville, 2.50@2.60		
Coke, prompt foundry, per net ton	Connellsville, 3.50@4.85		
White lead, dry	100 lb. kegs	New York, 13.75	
White lead, in oil	100 lb. kegs	New York, 13.75	
Red lead, dry	100 lb. kegs	New York, 13.75	
Red lead, in oil	100 lb. kegs	New York, 15.25	

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less	65%
Larger, up to 1 x 30-in., full kegs, list less	65%
Less than full kegs or case lots, add to list	10%
Fitting-up bolts: list less	45%
Lag screws:	
Up to ½-in. x 6-in., list less	65%
Larger, list less	65%
Less than full keg or case lots, add to list	10%
Rivets:	
Structural, round head, full kegs, net	$4.50
Structural, round head, broken kegs, net	6.00
Tank, 7/16-in. dia. and smaller, list less	65%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less	65%
Larger, up to 3-in., list less	65%
Less than keg or case lots, add to list	10%
Washers:	
Wrought, full kegs, per 100 lb., list less	$4.00
Wrought, broken kegs, per 100 lb., list less	2.00
Turnbuckles:	
With stub ends, list less	20–10%
Without stub ends, list less	55%
Chain:	
Proof coil, base, per 100 lb., net	$8.50
Cast iron welding flux, per lb., net	.35
Bronzing flux, per lb., net	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

N. J., Newark—Bd. of Education, Bd. of Education Bldg., Green St.—will receive bids until Dec. 10 for metal woodworking machinery.

O., Cleveland—Bd. of Education, F. G. Hogen, Dir.—machinery and equipment for shops and manual training department (after April 1) for proposed 3 story, 224 x 416 ft. high school on West 140th St. and Lakota Ave. Estimated cost $800,000.

Ont., Hamilton—City, S. H. Kent, Clk., City Hall—interested in prices on complete general equipment for proposed 1 story, 52 x 105 ft. civic machine shops on Elgin St. Estimated cost $70,000.

Ont., London — Dennisteel Ltd., 22 Dundas St.—iron and wire working equipment for proposed 1 story, 100 x 100 ft. addition to plant.

Ont., Petrolea—Superior Sugars Ltd., F. J. Potter, Pres. and Mgr., 4886 Maplewood Ave., Detroit, Mich.—wants prices on complete equipment for machine and blacksmith shop, etc., for proposed sugar refinery here. Estimated cost $3,000,000.

Opportunities for Future Business

Calif., Emeryville—Westinghouse Electric & Mfg. Co., Emeryville, awarded contract for a 1 story addition to factory on Powell St. Estimated cost $40,000. Noted Oct. 23.

Calif., Long Beach—Long Beach City School Dist., plans the construction of a vocational school at Willow and Pine Sts. Estimated cost $150,000. Architect not selected.

Calif., Oakland—F. L. De Sanno, 4437 East 10th St., awarded contract for the construction of a machine shop and foundry on Peralta St. Estimated csot $12,500.

Conn., Bristol — The Bristol Co., S. R. Bristol, Waterbury, plans additions and alterations to factory at Platts Mills. Estimated cost $50,000. E. A. Webster, 51 West Main St., Waterbury, Archt.

Conn., East Hartford — Texas Co., 31 St. James Ave., Boston, Mass., will receive bids until Dec. 12 for the construction of a group of buildings, including warehouse and boiler unit, 40 x 90 ft. garage, 42 x 80 ft. and two pump houses, each 15 x 16 ft. here. Estimated cost $50,000. Private plans.

Conn., New Britain—Eastern Malleable Iron Co., Inc., 63 Main St., postponed construction of 2 story factory on John St. $40,000. M. J. Unkelbach, 52 Main St., Archt. Project abandoned for present.

Fla., Miami—B. F. Goodrich Rubber Co., South Main St., Akron, O., plans the construction of a manufacturing and distribution plant here. Estimated cost to exceed $100,000. Private plans.

Ga., Augusta—City is having plans prepared for the construction of a new power plant. Estimated cost $1,000,000. Burns & McDonnell Engineering Co., 400 Interstate Bldg., Kansas City, Mo., Engrs.

Ill., Chicago—F. W. Gehrer, 3256 Grand Ave., manufacturers of metal specialties, awarded masonry and carpentry contracts for a 2 story, 63 x 82 ft. addition to factory at 3256-70 Grand Ave.

Ill., Chicago—Jones & Laughlin Steel Corp., 2250 West 47th St., has work under way on the construction of a 102 x 494 ft. warehouse on West 47th St. Estimated cost $200,000.

Ill., Chicago — Link Belt Supply Co., 418 South Third St., Minneapolis, Minn., plans the construction of a 2 story, 50 x 90 ft. addition to machine shop here. Estimated cost $25,000.

Ind., Crawfordsville—B. Remley, had plans prepared for the construction of an 82 x 130 ft. machine shop and garage at 120 West Market St. Estimated cost $40,000. C. Beeson, Archt.

Ind., South Bend—South Bend Current Controller Co., 247 LaPorte Ave., plans the construction of a plant. Estimated cost $50,000. Private plans.

Md., Baltimore — L. E. Mitchell, Inc., 915 East Monument St., is having plans prepared for a 2 story, 55 x 140 ft. machine shop. Estimated cost $30,000. H. G. Perring, Court Sq. Bldg., Archt. and Engr.

Mass., Charlestown (Boston P. O.)—A. J. Wilson, c/o B. Brown, 65 Franklin St., Boston, Engr., awarded contract for a 1 story, 90 x 130 ft. addition and alterations to garage at 39 Miller St., here. Estimated cost $40,000.

Mass., Everett—Edison Electric Illuminating Co., 39 Boylston St., Boston, is having plans prepared for the construction of a power plant and switching house extension at Mystic Station, Alford and Dexter Sts. Estimated cost $3,000,000. Stone & Webster, 49 Federal St., Boston, Engrs.

Mass., Holyoke—Bd. of Education, will soon award contract for a 3 story, 150 x 235 ft. vocational school on Beech St. Estimated cost $250,000. G. P. B. Alderman, 316 High St., Holyoke, Archts.

Mass., Malden — E. J. Lamothe Co., 25 Chestnut St., Somerville, manufacturers of galvanized ware, awarded contract for a 1 story, 100 x 140 ft. factory at Willis Ave. and Green St., here. Estimated cost $50,000. Noted Nov. 27.

Mass., Quincy (Boston P. O.)—Corey Bros., Shaw St., is having sketches made for the construction of a 1 story garage on Washington St. Estimated cost $50,000. Engineer not selected.

Mass., Tully—F. C. Warwick & Co., awarded contract for additions and alterations to factory. Estimated cost $40,000.

Mass., Watertown—New England Telephone & Telegraph Co., 245 State St., Boston, is receiving bids for the construction of a factory here. Estimated cost to exceed $40,000. Monks & Johnson, 99 Chauncy St., Boston, Archts. Western Electric Co., 379 Summer St., Boston, lessee. Noted Aug. 14.

Mich., Detroit—Wayne County Road Commission, Court House, awarded contract for a 1 story, 60 x 100 ft. machine and repair shop. Estimated cost $40,000. Noted Oct. 23.

Neb., Lincoln—International Harvester Co. of America, 606 South Michigan Ave., Chicago, Ill., awarded contract for a 1 story, 110 x 450 ft., warehouse and service building at 7th and J Sts., here. Noted Nov. 27.

Neb., Omaha—Union Pacific R.R., c/o R. J. Walsh, Pres., Union Pacific Bus Transportation Co., awarded contract for the construction of a 2 story, 158 x 300 ft. bus depot, garage and repair shop at 22nd and Leavenworth Sts.

N. J., East Orange—C. M. Grey Mfg. Co., 358 Central Ave., is having preliminary plans prepared for the construction of a 2 story die casting factory at Shepard Ave. between Nassau St. and Central Ave. Estimated cost $40,000. Architect not announced.

N. J., Montclair — Rudgers Builders Supply Co., 101 Greenwood Ave., will build a 1 and 2 story garage, shop, boiler house, etc. Estimated cost $150,000. Private plans. Work will be done by separate contracts. Noted Nov. 27.

N. J., Newark—Bd. of Education, City Hall Annex, postponed construction of a 3 story repair department building. $150,000. Architect not announced. Indefinite when project will go ahead. Noted Oct. 9.

N. J., Newark—J. C. Kohaut Inc., 117 Green St., rejected bids for 3 stroy, 50 x 100 ft. woodworking factory on New York Ave. Estimated cost $40,000. M. N. Shoemaker, 10 Bleecker St., Archt.

N. Y., Buffalo—Niagara Falls Smelting & Refining Co., 2208 Elmwood Ave., will soon award contract for the construction of a forge shop. Estimated cost including equipment $40,000.

N. Y., New York—Realty Utility Corp., F. A. Shaw, Pres., 122 East 42nd St., plans the construction of a 75 x 175 ft. service garage at Jerome Ave. and 196th St. Estimated cost to exceed $40,000. N. Rotholz, 122 East 42nd St., Archt. Maturity about March 1. Noted Nov. 13.

N. Y., New York—Rosella Building Co., 151 Mosholu Parkway, will build a service garage at Webster Ave. and 176th St. Estimated cost $75,000. Siegel & Levy, 1775 Broadway. Work will be done by day labor and separate contracts.

N. Y., Syracuse—W. H. Bissell, 109 South State St., plans the construction of a 2 story garage on East Washington St. Estimated cost $40,000.

O., Cincinnati—Colonial Stage Co., 708 Walnut St., plans the construction of a 2 story garage and stores on Sycamore St. Estimated cost $400,000. J. E. Branson, Union Trust Bldg., Archt.

O., Cincinnati—Midland Building Co., Burnet Ave. and Reading Rd., is having plans prepared for a 1 story, 100 x 300 ft. garage at McMillan and Melrose Sts. Estimated cost $150,000. Garber & Woodward, 616 Walnut St., Archts.

O., Cleveland—Bryant Heater & Mfg. Co., J. E. Kinner, Pres., 7225 St. Clair Ave., plans addition to factory. Estimated cost $200,000. Fox, Duthie & Foose, 1936 Union Trust Bldg., Archts.

O., Lorain—National Stove Co., subsidiary of American Stove Co., manufacturers of cooking and heating stoves, plans the construction of a building to be used as enameling plant. Estimated cost $250,000. Private plans.

Oklahoma — Bird Aircraft Corp., 17 Haverkamp St., Glendale, L. I., N. Y., plans the construction of an aircraft manufacturing plant at Oklahoma City or Tulsa. Estimated cost to exceed $40,000.

Okla., Oklahoma City—City plans an election Dec. 16 to vote $175,000 bonds for the construction of a municipal garage. G. F. Brown, City Hall, Engr.

Pennsylvania—Sun Oil Co., W. A. Courtney, Sun Bldg., Philadelphia, Engr., awarded contract for the construction of a 1 story, 45 x 65 ft. bulk plant to include garage, warehouse, office and pump house at Altoona, also at Brownsville.

Pa., New Brighton—William Leard Co., Inc., 4th St. (machinists), awarded contract for the construction of a 1 story, 40 x 109 ft. plant.

Pa., Pittsburgh—Dixon Motor Co., W. J. Dixon, Mgr., 109 Montgomery Ave., N. S., awarded contract for the construction of a 1 story, 50 x 120 ft. garage. Estimated cost $40,000.

Tenn., Memphis—Shelby County Institutions Commission, awarded contract for the construction of a new machine shop and garage at county work house. $64,675.

Va., Richmond — Virginia Wood Preserving Corp., A. L. Clark, Washington, D. C., Pres., is having plans prepared for the construction of a plant near here. Estimated cost $300,000.

Wash., Seattle — A. Kahn, 1000 Marquette Bldg., Detroit, Mich., Archt., will receive bids until Dec. 16 (extended date) for a 1 and 2 story assembly plant here, for Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich. Estimated cost $500,000. Noted Nov. 13.

Ont., London—Dennisteel Ltd., 22 Dundas St., C. E. Jarmain, Mgr., is having plans prepared for a 1 story, 100 x 100 ft. addition to plant for the manufacture of iron work for offices, fire escapes, lockers and similar lines. Estimated cost $50,000.

Ont., Oshawa — Coulter Mfg. Co., Toronto, awarded contract for the construction of a factory here. Estimated cost $60,000.

Ont., Toronto—Packard Electric Co., Warren, O., plans the construction of a plant for the manufacture of cable and wire products here. Estimated cost to exceed $40,000